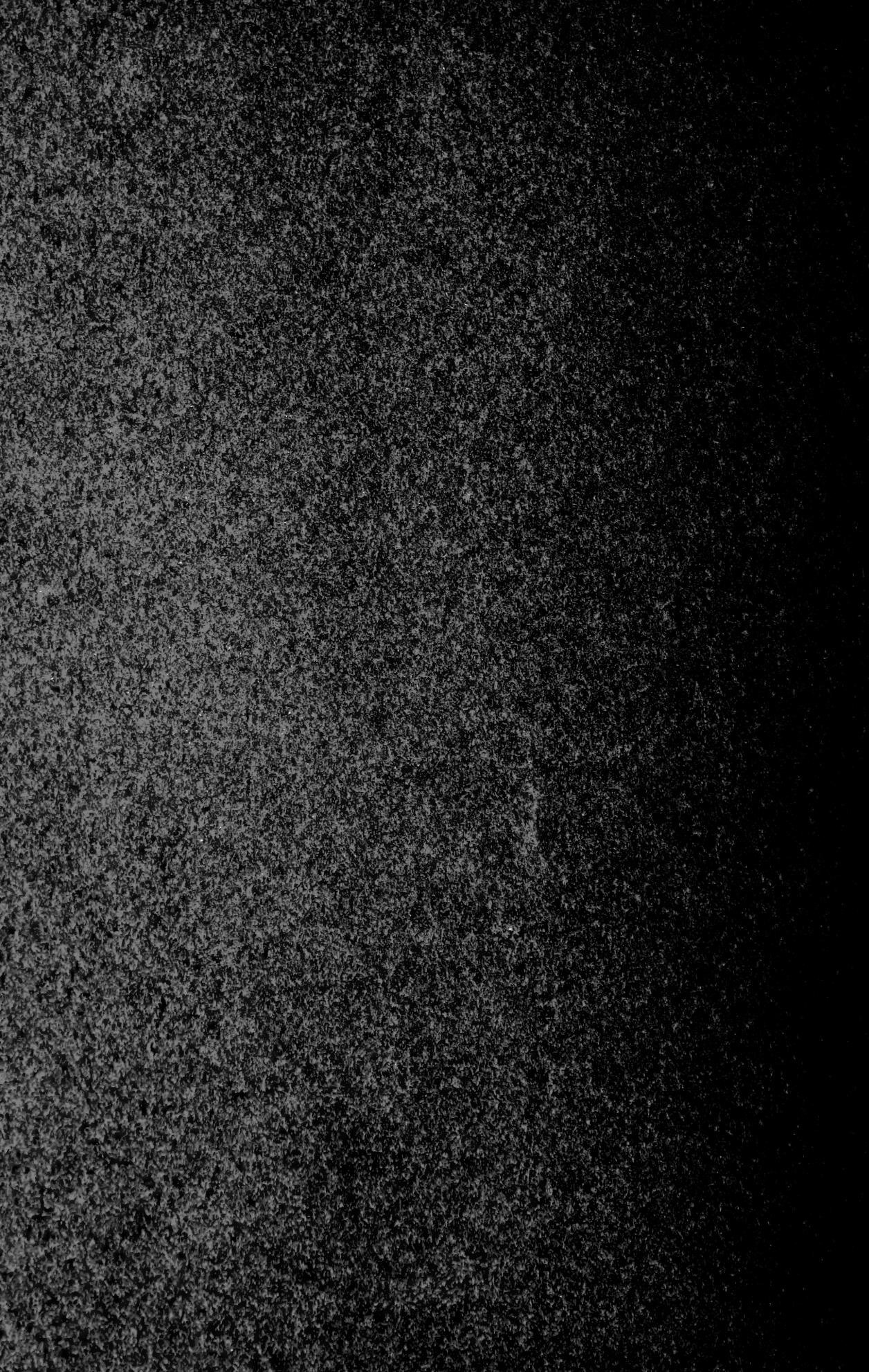


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U. S. Department of Agriculture

FOREST SERVICE

BRANCH OF RESEARCH

MONTHLY REPORT

OF

FOREST EXPERIMENT STATIONS

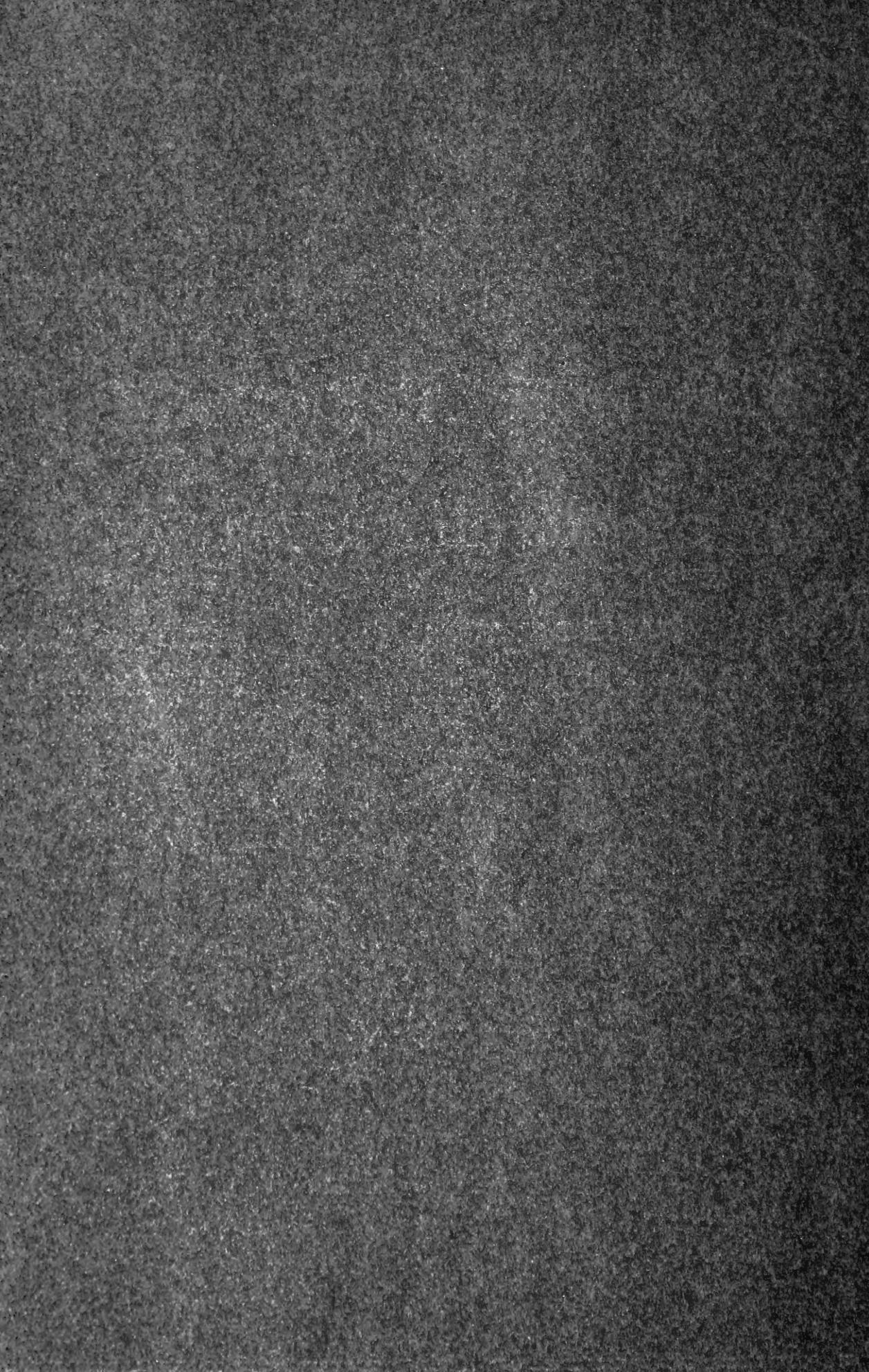
FOREST ECONOMICS

FOREST PRODUCTS

RANGE RESEARCH

OCT 1928





BRANCH OF RESEARCH

October, 1928

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FOREST EXPERIMENT STATIONS

WASHINGTON

General

Messrs. Clapp and Munns had planned to leave Washington during October for extended field trips. However, the field classification material demanded so much time in further supplemental information that Clapp failed to get away, and Munns left the very end of the month. Field schedules in the classification were carefully considered, and an attempt made to bring about correlation between the various professional grades of kindred groups as in Silviculture, Economics, Range Management, Wood Technology, and Forestry. Class specifications were worked out for the various grades and specifications as a basis for Personnel Classification Board consideration in an endeavor thus to set the standards for all similar professional grades throughout the governmental service. These specifications for the professional groups, and those to be prepared in the administrative organization for the clerical, administrative and fiscal groups and the sub-professional groups, will be considered by the Service Committee composed of the various District Foresters and Assistant Foresters, and by representatives from the Laboratory and the experiment stations. The endeavor has been to define the places so that comparable responsibility can be covered in comparable grades, and to provide for ready change in grade with a change in these responsibilities.

Tree Names Again

The old Service Committee on Tree Names, composed of Shepard, Merrill and Sudworth, fulfilled its function with the publication of the Check List. A new committee is to be appointed by Major Stuart for the purpose of settling matters of nomenclature.

The Bureau of Plant Industry has raised a question with the Department regarding the spelling of common names of plants. A simple rule would make a compound name spelled as one word or hyphenated instead of written as two words. Thus knob-cone would become knobcone; Douglas fir would become Douglas-fir, and honey locust would become honeylocust. The Forester has agreed to the spelling with certain exceptions, although a number of Check List names - those of minor species - would be changed in governmental publications. For species like red gum, Douglas fir, and western red cedar, the Service reserves the right to hold to the spelling used in the lumber trade. The adoption of "Standardized Plant Names" with these exceptions, will procure uniform spelling of common plant names in all governmental publications, a thing devoutly desired but hitherto unobtainable even in the Department's own publications.

(Over)

Committee to Examine Duties and Job of a Ranger

Partly as the outcome of contacts the Service has had with forest schools as to what the Forest Service as an employer of foresters has to offer graduates of forest schools, a committee has been appointed to consider the question and to draft a statement which will more specifically define the requirements and opportunities of forest ranger, assistant forest supervisor, and forest supervisor positions. Major Stuart believes the question important enough to merit special consideration and accordingly appointed a committee consisting of Messrs. Pooler, Morrell, Peck, Kelley, Headley, Munns, and Shepard, to carefully consider what the position of the Forest Service really is toward the forest ranger or toward the graduate of a forest school who seeks employment in the Service.

Mississippi Flood

After considering various possibilities, Mr. Sherman decided against pushing at this time the revision of Forests and Water. It was originally planned to bring this publication up to date, and Zon, with the help of Lowdermilk and Kraebel, was to spend the autumn upon it. The change in plans is relieving us of much work and worry at a time when we were glad to step out from under. The revised regional reports are now all in, the maps largely completed, and all that remains is the introductory foreword. This Munns will work upon this November and early December. Most of the eastern stations have been attempting to get at the question of the absorptive and retentive effect of litter through simple studies. This, however, does not settle the big question of the effect of forests upon water or upon erosion, which question is growing constantly larger.

Identification

Specimens of cones, needles, leaves, etc., are constantly being received by the Washington office for identification. Under a new policy to be followed in Washington, hereafter all such specimens will be sent to the station covering the region from which the material was received. It is believed that the experiment stations will be able to care for such miscellaneous identification, and this change in policy is brought about by the fact that there is no one in the Washington office who is specializing primarily in dendrology.

Change in Designation

Attention is called to a change in file designation. The RD designation is no longer used, but in its place we are using RS with the letter "B" for botanical work covering the five lines of work - arboretum, breed-

ing, heredity, phenology, and nomenclature. Thus the designation will be:

RS
B-Arboretum
(Name of Station)

Correspondence relating to Identification and to Distribution of tree species will be handled under the following designations:

RS	RS
TS-Identification	TS-Distribution
White Oak	White Oak

Last month there were 1,000 loans of books and periodicals from the library, and 163 members of the Service and others consulted the library in person.

During the month 214 books and articles were indexed for the card catalogue.

NORTHEASTERN FOREST EXPERIMENT STATION

A silvicultural practice that is steadily gaining ground in New England and New York is the girdling of hardwoods to release the under-story of red spruce and balsam fir. Twenty years ago three half-acre plots were established at Corbin Park, New Hampshire. One was a check plot; on another all the hardwoods were girdled; and on the third the hardwoods were girdled, except for white ash and the better individuals of yellow and paper birch. When examined recently these plots presented a striking contrast. The under-story of red spruce with a little balsam fir has been making very slow height growth on the check plot, while on the two girdling plots height growth has been several times as rapid.

Late in September, 1927, Westveld established three weeding or cleaning plots on the Battell Forest near Middlebury, Vermont, in a stand of spruce and mixed hardwoods that had been cut over four years ago. One plot was left as a check plot; on the second a light weeding was given, that is, the inferior species, such as striped maple, fire cherry, and red maple, were cut to release red spruce, paper birch, yellow birch, and hard maple; on the third plot, the same weeding was done, only more intensively. An examination about a year later showed the results of this work to be distinctly disappointing. Fire cherry had sprouted with unusual vigor, and instead of one main stem there are now from three to six sprouts from each sapling, all within a foot or two of the height of the

original stem in 1927. It may be that if the weeding had been done in June or July when the trees were at the height of their productive growth and consequently much more susceptible to injury, it would have been more effective. This will have to be worked out. Neither striped nor red maple had sprouted at all vigorously, but, unfortunately, fire cherry was the most abundant weed species on the area.

Westveld and Spaulding laid out two new sets of slash disposal plots, one at Johnson Brook and one at Waterville, both on the White Mountain National Forest. While these plots are on different slopes than those previously established at Cherry Mountain, also in the national forest, the same methods of disposal are to be used, i.e., (1) lopping of both hard and softwoods; (2) leaving unlooped both hard and softwoods; and (3) leaving unlooped hardwood, and burning softwood slash.

The fire weather stations at Smyrna Mills, Maine, and at Elk Lake, New York, were closed down about the middle of the month, when observers J. Truncer and A. Spillars returned to school. The Smyrna Mills station is maintained in cooperation with the Maine Forest Service, and the Elk Lake station with the New York Conservation Department and the Finch-Pruyn Company of Glens Falls, New York. The station at Cranberry Lake, New York, operated by the New York State College of Forestry, was closed early in the month. The station at Petersham, Massachusetts, which is supported by the Harvard Forest, will remain open until all forest fire danger is past.

Stickel spent the greater part of the month working on the field data of the chestnut replacement plots on the Mount Toby State Demonstration Forest. These plots are located in a Northern white pine plantation, established in 1919 on an area from which the blight-killed chestnut had been removed. Although cut over almost ten years ago, the chestnut stools are still sprouting vigorously, and in 1927 had produced sprouts which averaged 8' in height, which are, however, usually killed back by the blight when they reach the age of two to three years. One sprout produced fruit, which, however, failed to germinate when tested in the office.

At the request of the Washington office, Stickel made some 38 moisture retentive capacity tests of litter and duff samples common to the principal forest types of the Northeast. Samples from pure coniferous, mixed coniferous, pure hardwood, mixed hardwood, and mixed coniferous-hardwood stands were used. In determining how much water the samples held after being soaked for two days and before being placed in the drying oven, the water-soaked samples were filtered through coarse paper and all the excess water drained off. Surprisingly large moisture retentive figures were obtained, varying from 699 per cent water retained for pure hardwood duff (white ash, red oak, black birch, and hard maple) to 142 per cent for a complete organic horizon of a red spruce

and balsam fir stand. As was expected the hardwood sample had a greater moisture-holding capacity than the softwood samples, averaging from 50 to 100 per cent more. Where both litter and duff samples of the same stand were used, the latter held just twice as much water as did the former. Thus, a sample of Northern white pine duff retained 626 per cent water in contrast with 357 per cent moisture of a litter sample from the same forest. For pure hardwoods the difference between litter and duff did not seem to be so great, being in one case 699 and 634 per cent, respectively.

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CENTRAL STATES FOREST EXPERIMENT STATION

General

McCarthy attending the meeting of the National Association of State Foresters held October 1-4. After one day's meeting in Wooster, where plantations on the Ohio State Agricultural Experiment Station Farm were examined, the party came to Columbus, spent one day in meeting at Columbus and then traveled southeastward, visiting the Scioto Trail Forest, the Waterloo Forest, and the Marietta Nursery of Ohio.

TS-12

Late in September Hanley, accompanied by Coile, went into West Virginia by way of southern Ohio. They placed metal signs on about 47 plots previously measured in even-aged stands of oak. These plots were also marked on one corner with an iron pipe so that they may serve for remeasurement after a period of five years if this is found desirable. They continued the oak study work in West Virginia, where they examined second growth stands reported by the Extension Forester of West Virginia. Twelve additional plots in second growth hardwood were obtained in this State and in addition to this about 203 tree measurements on cut timber were added to the data for construction of volume tables.

Hanley's party then went into Pennsylvania to examine some portable mill operations reported by a district forester of Pennsylvania. A number of portable mill operations in the vicinity of Everett and McConnellsburg, Pennsylvania, were examined but at no place were the cuttings found suitable for the continuation of volume table measurement work. The party returned to Columbus on October 21.

McCarthy investigated a cutting along a telephone line from Cambridge, Ohio, to Canton, Ohio. Kellogg and Coile worked about a week on the felled timber along this line securing measurements for volume tables.

Hanley, after attending the Reunion of Michigan Foresters at Ann Arbor, secured the assistance of one temporary employee, Fred P. Struhaker, and at the close of the month was working in southern Michigan securing yield tables for the oak study.

Upon advice of Telford in Illinois, Kellogg went to the operation of the Egyptian Tie and Timber Company in the bottoms of the Little Wabash River. Although considerable timber was being felled, the falling was done at widely separated points and, as a consequence, tree measurements were found to be very expensive. This operation, however, provides good stands of pin oak and southern red gum and is a good location for taking tree measurements of these species. Pioneers in this locality state that these bottoms originally held a splendid stand of big shellbark hickory. This stand was largely killed by an untimely flood in August about 1875. These bottoms were also culled over at an early date for occasional walnut and white oak. The two operations made possible the ingress of red gum and pin oak in varying amounts. There are occasional groups of hickory, silver maple, elm and ash. Those pin oaks which were measured invariably gave an age of 50 to 59 years. In places pin oak reproduction completely covers the ground.

Fp-1

In the early part of the month Coville and Kellogg went to Frankfort, Kentucky, where the State Forester's files were consulted to secure locations of older forest plantations in that state. They next visited the Clark County forest of Indiana, which contains some very valuable and interesting plantations. The nursery of Mr. J. M. Wilkinson near Rockport, Indiana, was next visited to allow Coville to meet Mr. Wilkinson and familiarize himself with the type of plant breeding, grafting, and hybridization which is being done there. This trip included a part of the Knobs region south of Indianapolis.

Day and Kellogg attended the annual meeting of the Ohio Valley Section of the Society of American Foresters in southern Michigan. In the course of field travel several very promising plantations were located, and it seems highly advisable to extend the present plantation study to include those in southern Michigan. Of considerable interest was a 63-year-old plantation in which sugar maple, yellow poplar, hickory, white pine, Scotch pine, larch, and Norway spruce have been planted. The man who made this planting did so at a time when Michigan's timber was in its prime. He is accredited with having made this plantation purely on account of his love for trees and interest in having them growing on his property. The hard maple, yellow poplar, and conifers are all reproducing very nicely, but the hardwoods have been prevented from getting beyond the seedling stage on account of grazing.

Another area which held a great deal of interest is the estate of Mr. Felt. This property lies on the eastern shore of Lake Michigan north of Sangatuk and includes a considerable stretch of sand dune country. Before lumbering, and the fires which followed it, had removed the pine and hardwood covering from the dunes, no trouble was experienced from movement of the sand. Mr. Felt has found that these dunes have been moving on an average of 10 feet per year away from the lake. In one instance a dune advanced 50 feet. Although it is not necessary that he continue to live where he does, Mr. Felt has taken great pleasure in battling with the dune problem for his own satisfaction and pleasure. He has established a small nursery in which he is now producing the planting stock which he is using in his reclamation work.

In the course of his experience in this particular locality, Mr. Felt has found that the vegetative succession on his dunes is as follows: first, a light carpet of Hudsonia tomentosa appears as tiny scattered plants. As soon as the sand has ceased to move rapidly a few specimens of Bearberry (Arctostaphylos Uva-ursi) appear. These grow quite rapidly and spread out in characteristic matlike form. The second stage brings in a scattering of weeds and annuals. The next stage witnesses the appearance of sassafras as the pioneer species. The last stage finds various oaks, beech, and other species succeeding the sassafras. In places where coniferous seed supply is at hand white pine comes in before the hardwoods have taken the area.

Mr. Felt considers the sand of the lake dunes as more fertile than those he had observed in Asia, which causes the vegetation to become more quickly established along the edge, thereby changing the shape of the dune.

In European sand reclamation certain species of beach grass have been found to be very useful in tying down the dune prior to forestation. In this locality, however, the local dune grass survives and thrives only where sand is being filled in, not where it is blowing out. The species seems to be unable to maintain control of an area where the wind secures much of a foothold. The use of grass, therefore, does not enter into Mr. Felt's plan of dune control.

After several years' experience, the procedure which has been found most successful is as follows: limbs, branches and brush are scattered over the uncovered area at the end of the dune which is being cut out by the wind. At the same time oats are sown on the area. This combination provides for an immediate control of the blowing sand and can be followed by planting of suitable forest stock on the area. In places Mr. Felt has been planting Balm of Gilead as a light shade under which he later plants conifers. As he has been producing Balm of Gilead by means of cuttings, a considerable expense has been incurred by this double planting. His present method is to place the cuttings directly in the field and let them root in place rather than to grow them first in the nursery. He has found that this system works just as well or better.

As soon as a strip at the head of the dune has been captured a strip down wind is similarly treated, and following its capture an additional strip is treated. In brief, Mr. Felt's system consists of capturing successive strips rather than endeavoring to capture a whole eroding area at once.

Flood Study

Day has been engaged at intervals during the month of October in the study of moisture capacity of leaf litter. The study has been carried on in the oak-hickory and beech-maple types. The study involves the selection of field samples and oven drying to determine oven dry weight. An attempt was made to secure data on the leaf litter retained through the summer as well as that found after the autumn leaf fall.

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LAKE STATES FOREST EXPERIMENT STATION

The summer's collection of data bore many shapes depicting the special line of activity which each man had followed. For instance, surrounding Bates were 40 canvas sacks filled with seed from specially selected Norway pine mother trees growing in widely scattered parts of the Lake States. These seeds will be planted next spring for growing seed trees of known origin. A well-beaten track leads from his office to the greenhouse where Norway pine soils, sown with seed of Norway, white, jack, and Scotch pine are given normal temperature conditions and measured amounts of water. About 120 samples of white pine seed have been given various pre-treatments and arranged for storage under four different conditions with the object of finding both the effect of storage and means for hastening germination either for fresh or for old seed.

The crash of calculating machines marks the office where Mitchell and Lotti are working up data in connection with the fire hazard study. The boys had "bad luck" this fall. It rained so much that they could record only a few small "flash" fires. Intermittent rains also made it difficult to determine normal relationships. So far the data indicates that while precipitation is the controlling factor in the absence of rain, relative humidity is of primary importance.

Data collected by Averell in northern Minnesota, covering the more important ditching systems in six counties, should give an answer to the following questions; first, did the ditches have a good or a bad effect upon the forest growth; second, how far back from each side of the ditch did this effect extend; and third, what did this effect amount to in volume growth expressed as cords per acre per year. A report shall be made to the State Drainage Engineer of both Minnesota and Wisconsin before the end of the year on the results of the studies in their respective states.

A study of how fast hardwoods grow after partial cutting shows that the average growth in diameter for sugar maple and hemlock for sixteen plots studied in northern Wisconsin is 3.3 inches for a 20-year period following cutting. Hemlock shows a greater response to partial cuttings than maple, however, the former growing 1.8 inches in diameter for the 20-year period prior to cutting and the latter, 2.0 inches. Basswood makes the best growth in diameter after partial cuttings, 4.0 inches in 20 years. Elm and yellow birch do not do so well, growing at the rate of 2.5 inches in diameter for the first 20-year period following cutting. The rate of diameter growth is in general about twice as great after partial cuttings as before, and the increase (actual) is in direct ratio to the severity of the cutting.

An average annual increment of 120 board feet per acre per year was found for nine plots studied. The cutting for all of these areas was very severe, leaving about 15 per cent of the original volume of the merchantable stand or 1050 board feet per acre. The average volume of the present stand, 25 years later, is 4200 board feet. If the original cutting had been somewhat lighter, the growth would have replaced the volume cut.

A report covering an analysis of the data and an explanation of field and office technique is being prepared for the Wisconsin Legislature.

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APPALACHIAN FOREST EXPERIMENT STATION

General

The California Station's offer to determine the rate of fall of seed of different species presented an excellent opportunity to obtain this information for a number of projects. Accordingly, small samples

of seed were collected by various members of the staff and sent to Berkeley for the tests. The samples included seed of yellow poplar, basswood, yellow birch, red spruce, southern balsam fir, mountain pine, loblolly pine, Virginia pine, white pine, and southern white cedar. Small amounts of seed of other species were collected at the time to supply numerous requests.

A trip by Frothingham and Korstian to meet W. R. Mattoon and State Forester Staley at Summerville, S. C., came to an abrupt end at Sumter, S. C., when the Station's Chevrolet truck capsized, breaking Korstian's left collar bone. Korstian received medical treatment at a hospital in Sumter, and at last reports was getting along satisfactorily. The accident, which occurred on the evening of October 30, was due to skidding on a wet asphalt pavement.

Loblolly Pine Study (M-111)

The second week in October, Korstian, MacKinney, and Field Assistants Craig and Blidberg left for Smithfield, Va., to take up work on the study of increased growth in loblolly pine left at the time of cutting. Last year it was found that increment borings taken on different sides of the tree varied as much as 200 percent. In addition to checking this discrepancy it was desired to study the allocation of the increased growth on the stem and the possible changes in form of the trees remaining after cutting.

Permission was obtained from the Surrey Lumber Company to cut 30 or 40 trees on some of their cut-over areas. The trees chosen were described in detail, felled, and sections taken at breast height, at ten-foot intervals up the tree to the base of the crown, and at five-foot intervals above the base of the crown. These sections were trimmed, coated with a mixture of paraffin and gasoline, and packed in moist sawdust for shipment to Asheville, where they will be measured this winter.

Korstian returned to Asheville after getting the party well started on their work. Paul, of the Forest Products Laboratory, visited the party and arranged for the cooperation of the laboratory in obtaining specific gravities of the wood at various periods on different sections. Reineke and Clements of the Washington Office also paid a visit and gave some valuable suggestions for the work.

No results from the study are yet available, but one outstanding observation is worthy of mention. On practically all leaning trees the increase in growth after cutting was most noticeable on the under side of the lean. In many cases acceleration was barely noticeable on the top side of the lean, but on the lower side growth was from three to six times as fast after cutting as before. However, on a few trees the great

est growth after cutting was noticed on the top of the lean, indicating that other factors than lean are operative in governing the location of the increased growth in the tree after cutting.

Thinning Studies (Mt-1 and Mt-2)

All the permanent sample plots in the Biltmore Estate were remeasured, and the trees classed, by a party under the leadership of C. A. Abell. Heights of a number of the trees in each plot were measured, numbers repainted, and missing tags supplied. Light thinnings will probably be made in some of the plots this winter.

At Cranberry, N. C., J. H. Buell and party remeasured the yellow poplar plots established by State Forester J. S. Holmes in 1920 and remeasured by McCarthy in 1922. The party also laid out five half-acre plots, the trees of which were tallied by diameter and crown class. These tallies were later worked up in the office, and the summaries were used by Buell in preparing a graphical analysis of the stands as a partial guide to contemplated thinning experiments. The five stands are as nearly pure poplar as is commonly found in this region. They should serve as an excellent means for trying out comparatively several methods of thinning. It is proposed to mark the trees for thinning during the winter or early spring. The cutting will be done by the Cranberry Iron and Coal Company with which the Station is cooperating.

Forest Influences

For use supplementary to the general report of the Washington Office on the influence of forests upon waters, an effort was made to obtain some specific data as to the amount of litter present on the hardwood forest floor in the Asheville region, its absorptive effect, and its influence upon water retention and water run-off. Preliminary data have been compiled by Dr. Hursh from observations and litter samples collected by him just prior to the 1928 leaf fall.

The basis for estimate of the amount of litter on the forest floor was the actual weight of the litter from unit areas of one square yard taken every half chain along a strip through the forest area under observation. The moisture content of the litter was determined by drying representative samples of the litter in a regulated oven at 90° C. The water holding capacity was similarly determined by soaking representative samples at room temperatures for 48 hours, determining the weight of wet litter, and subsequently determining the moisture loss by drying.

The results of some of these determinations for the forested mountain areas in the vicinity of Asheville is given below. The figures shown are based on averages of a number of observations and are supposed to approximate average conditions of density of stocking for the different mountain areas represented. Percentage figures are all on basis of oven-dry weight.

Comparative Absorptive Effect of Litter From Representative Mountain Areas, Asheville, N. C.

Location	: Weight per acre:	Water holding: oven dry basis:	Water held: capacity of litter, oven dry basis	Equivalent acre of litter	precipita- tion
	: Pounds	: Per cent	: Pounds	: Inches	
Lower slope, north aspect	: 13,310	: 316	: 42,060	: 0.186	
Middle & upper slope, north aspect	: 10,212	: 534	: 54,532	: 0.241	
Lower slope, south aspect	: 16,359	: 264	: 43,188	: 0.190	
Middle and upper slope, south aspect	: 3,146	: 241	: 7,582	: 0.033	
Cove bottom	: 7,405	: 531	: 39,320	: 0.174	
Cove, lower slope	: 9,148	: 531	: 48,576	: 0.214	
Pastured and browsed slope	: 1,791	: 248	: 4,442	: 0.020	
Similar adjoining unpastured slope	: 10,067	: 297	: 29,899	: 0.132	

These data have their limitation in being based on observations made at a season of the year when working and packing of the litter is most conspicuous. They will be supplemented by further observations made after the 1928 leaf fall, and subsequently throughout the ensuing seasons. It is hoped in this manner to determine a fairly accurate figure for the absorption effect of forest litter and its influences on water run-off from forest lands.

Frothingham attended the fourth Southern Appalachian Power Conference at Atlanta, Ga., October 8-10, and gave an illustrated address on the subject "Forest conservation in the Southern Appalachian region, with special reference to power development and the protection of streamflow." A resolution was passed by the Conference urging the Secretaries of Agriculture and Interior to conduct studies of the relation of forests to streamflow and erosion in the Southern Appalachian region.

MacKinney, assisted by Abell and all the field assistants, re-measured and tagged the new reproduction on the square rod and one-acre plots at Bent Creek belonging to the chestnut replacement and methods-of-cutting-hardwoods studies.

ALLEGHENY FOREST EXPERIMENT STATION

Student Assistant Donald Thatcher arrived and went immediately to work on volume table measurements in the vicinity of Washington; he was assisted by Mr. E. A. Knobelauch, a member of the faculty of the University of Pennsylvania, who wished to obtain outdoor employment for a short time.

Forbes and Lutz spent the latter half of the month on a general round of northern New Jersey, eastern Pennsylvania and Maryland. They were guided through northern New Jersey by Associate Forester Baker and Assistant Forester Moore of that State, and by the supervisor of the Stokes State Forest, Mr. Dewald. They saw something of the rather extensive and well-developed plantations that are to be found at a good many points in our territory; looked over general conditions on the Stokes State Forest, which is one of the areas to be given consideration as a branch station; and had the rather unique experience of examining a commercial forestry enterprise, that of the New Jersey Zinc Company, within forty miles of New York City. Although the State's program of experiments in northern Jersey is by no means as extensive or as far advanced as the work done in south Jersey, an interesting start has been made with methods of cutting, thinning, and underplanting. It was interesting to find that Baker in general favors the clear cutting of the present even-aged sprout hardwood forests of his State, and its replacement by a forest consisting of planted conifers, and sprout and seedling hardwoods. This is almost the opposite view to that held by Hofmann of Mont Alto, who is relying on natural regeneration obtained through partial cuttings of varying degree of severity. That clear cutting is by no means the only practical method of cutting in hardwoods was pretty well demonstrated by an area of 300 acres seen at Lake Hopatcong, cut over under the direction of H. V. Bailey, until very recently forester

for the New Jersey Zinc Company. Bailey has since stated in correspondence that he considers partial cuttings to be entirely practicable both silviculturally and economically. Forbes, who spent considerable of his time years ago in northern Jersey, was impressed by the success which has been attained in forest protection on the State forest; only about ten acres have burned over in eleven years.

From Jersey Forbes and Lutz proceeded to south Bethlehem, where they were shown six acres of interesting plantations made in 1915 by Lehigh University. A wide variety of species has been used on the bare rocky hillside chosen for the experiment, and the most striking feature of the plantations is the fair success attained with white, burr, and red oaks. A number of factors have detracted from the value of this plantation, among them a fire about five years after its establishment. Lehigh University, through its superintendent of grounds and buildings, has established a very creditable arboretum, all on University land adjacent to the plantations. The most interesting observation made ^{by} the staff members on the Delaware State Forest, in the foot-hills of the Pocono Mountains, was that pitch pine appears there to reproduce only in even-aged stands, in contrast to its apparent habit in south Jersey, for example. The state of Pennsylvania has two men at work on a systematic study of this species.

Reinforced by Coville from the Washington office, Forbes and Lutz drove to Mont Alto, where they spent two extremely interesting days. The school boasts some very fine plantations of conifers, particularly white and Scotch pines, and has experimented extensively with a large number of both conifers and hardwoods. Some of these stands are now bearing seed, and stations for future seed collection have been selected. It is interesting to see how well natural stands of shortleaf pine do at this northern extension of its range. Dr. Hoffman's ideas on reproduction of hardwoods have already been mentioned; he showed us some very interesting partial cuttings, now two or three years old, both in coves and on lower slopes. Hemlock, which had not reproduced at all under the shade of well-grown trees of that species, is very abundant where sufficient openings have been made by cutting, and white pine is present in encouraging numbers. The partial cutting appears to have stimulated seed production of the oaks, and a good crop of oak seedlings is to be found in the openings. Development of the inevitable sprouts from the stumps of the trees removed in the partial cutting has evidently been held pretty well in check by the shade of the trees left. Hemlock, here as in northern Jersey, seems quite able to regain a place on rocky slopes from which repeated fires, rather than drought, appear to have driven it. White pine does not seem to have the struggle to maintain itself in the eastern part of our territory that it apparently faces on the Allegheny Forest. Baker showed us some excellent although scattered advance reproduction of white pine coming from seed blown long distances to rocky ridges long dominated by chestnut oak and other hardwoods.

In western Maryland, which was seen by the same party under the guidance of Assistant Forester Pfeiffer, the most interesting sights were small areas of native spruce, and about three hundred acres of very old white oak on one of the state forests. No member of the party had the temerity to identify the spruce positively as Picea rubra, but the fact that in one small stand trees had attained a D.B.H. of six to eight inches, and a height of twenty-five or thirty feet in thirty years, lead us to believe that it could hardly be Picea mariana. The State has helped to plant quite an area of land in Garrett County owned by a Pittsburgh man, and these plantations, together with a little native forest vegetation still present on the badly burned sites, will be interesting for us to watch. The oak stand referred to is probably well past 150 years of age and resembles the virgin forest in its all-aged form. The chief associate is red maple. It is quite probable that the State will be willing to set aside a small acreage for preservation in untouched form. This stand, together with another area in Garrett County in all stages of succession from hemlock to white pine, will also bear study. Unfortunately, the hemlock and white pine land is not as securely in State tenure as the oak.

Enroute to the eastern shore of Maryland the party passed through the extreme northeastern portion of West Virginia. Even this brief glimpse of the State impressed us with the wonderful opportunities for timber growing on land obviously of very low value for agriculture, because of the slopes, but nevertheless very productive of timber crops because of the comparatively deep soil. It is incredible that in this day and generation forest land of so much promise is still so subject to the scourge of fire.

State Forester Besley took the party on a brief tour of the Eastern Shore, in the course of which Forbes renewed his acquaintance with that remarkable species, loblolly pine. Although generally grown in pure, evenaged stands, the species appears to flourish in the mixed and all-aged stands which it is logical to believe were typical of the virgin forest. Some of the operations described in Cope's bulletin on the species were visited, rain interfering with any extensive travel. The return trip to Philadelphia took the party through Delaware, the fourth State in our territory.

Forbes visited during the month the Boyce Thompson Institute at Yonkers, where he met Director Boyce of the Northeastern Forest Experiment Station and of course Dr. Crocker and various members of the institute staff. He called on Dr. Lipman at New Brunswick.

Dana's manuscript on timber growing in the Northeast was reviewed by Forbes, who also addressed the Lumberman's Exchange of Philadelphia on the work of the station. Wood assisted in the local observance of fall Arbor Day by talking on the Forest Service before the Philadelphia

High School for Girls. As a result of the pressure of his new job, Aldo Leopold was obliged to turn over to Forbes the chairmanship of the committee on the annual meeting of the Society of American Foresters. Although the program had been decided upon in broad outline considerable work remained to be done in lining up speakers.

State Forester Hine of Louisiana visited the station enroute to Washington from the annual meeting of the Association of State Foresters. Secretary Round of the Allegheny Section called for information on the practice of private forestry in our region.

Management

Field work on the Allegheny Forest was completed early in the month, and Lutz and Hough have been working on the preliminary arrangement and analysis of the season's data. Lutz completed the acidity determinations on a number of soil samples and has been choosing the equipment for our small laboratory.

The heavy acorn crop, which seems to extend over the greater part of our territory this fall, and which includes both black and white oaks, has afforded us too valuable an opportunity to miss for seed studies at Camp Ockanickon. Accordingly, several isolated trees, particularly of chestnut and white oak, have been numbered for study this year and in successive seasons. Unfortunately, it is much too late to attempt acorn counts because no areas have been fenced against rodents, and our main reliance must be the count of fully-developed cups found on measured areas under the trees. This is admittedly an inadequate basis for a comprehensive study, but should at least yield us comparative figures as between trees of different diameters and crown class.

Mensuration

With the help of Reineke and Clements of the Washington office Schnur scouted for oak yield plots in New Jersey and Connecticut. Because of irregularity in past cutting, no areas satisfactorily stocked and even-aged were found. A few tree measurements were, however, obtained in Connecticut. In Connecticut Schnur had the guidance of local men from the State Forester's office; he took advantage of the opportunity to call at the Yale Forest School, and later on, in connection with a few days annual leave, at the Central States Station in Columbus.

SOUTHERN FOREST EXPERIMENT STATION

General

Demmon spent practically the whole month preparing the investigative program to be presented to the Advisory Council at its meeting in November.

Wahlenberg went for a month's detail to Starke, Florida, while Harper will spend the month of November in the New Orleans office and at Urania, Louisiana. At the end of the month Demmon, Wyman, Pessin, and Harper went to Valparaiso, Florida, to attend the Advisory Council meeting. Lindgren left for an extensive trip to the Pacific Coast in connection with his studies on "blue stain."

Mr. Miller of the Columbia Naval Stores Company of Pensacola, Florida, and Professor Floyd of the University of Florida were the visitors at the Starke branch. Professor Floyd spent half a day showing his forestry class the turpentining work done by the Starke branch at the Kingsley Lake Tract.

Protection, Fire

Wahlenberg burned over the "fall-burn" plot at McNeill, Mississippi, and Barrett and Righter succeeded in burning the "fall-burn" plots in Texas and at Urania. Pessin completed compiling and analyzing the data collected on the five-year fire plot studies at McNeill, Mississippi.

Management

Barrett and Righter made preliminary tallies of all new thinning plots at Urania, Louisiana. Diameter breast high and height measurements were taken of all the trees on the different plots. An analysis of the data indicated that of the 19 plots three were overstocked and two understocked.

Pessin made observations on the reproduction strips at Talisheet, Louisiana, and reports lack of evidence this year of a longleaf pine cone crop in the vicinity of the experimental plot.

Naval Stores

Harper brought up to date the dipping records for the different plots. Wyman and Harper designed and drew plans for the different styles of chipping tools applicable to the French system of turpentining. The turpentine exhibits shown at Waycross, Georgia, were sent to Meridian, Mississippi, and from there will be shipped to Savannah, Georgia, for exhibition at fairs during November.

Forestation

Barrett and Righter collected at Urania, Louisiana, several sacks of seed of shortleaf, loblolly, and sonderegger pines. The seeds were extracted and cleaned by Wakeley at New Orleans. Wyman and Harper collected eight bushels of slash pine cones from trees blown down in the September storm at Starke, Fla. Some dogwood berries and live oak acorns were also collected.

Protection, Others

Grazing. Wahlenberg made observations on the strips at McNeill, Mississippi, to determine the degree of grazing on the different strips and found that the doubling of the number of cattle on the unburned area this year resulted in considerable reduction of the "rough."

Mississippi Flood Control

Wahlenberg, Barrett, and Righter collected samples of litter from different plots at Urania, and shipped them to New Orleans, where Wakeley studied the water holding capacity of the litter in connection with the flood studies. Samples of litter were also collected by Wahlenberg at McNeill, Mississippi.

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CALIFORNIA FOREST EXPERIMENT STATION

General

Following the fire fighting in southern California at the month-end for Kotok, Dunning, and Kraebel, the District Ranger Training Camp, starting on October 8, occupied a considerable slice of time, with necessary preparation of material, for Hill, Dunning, and Siggins. Kotok will appear there for the fire discussions in November. The subjects thus far presented are: Introduction to scientific and research subjects, botany, ecology, and other fundamental data, forest influences, forests in earth history, dendrology, economics, forest products (Hill); forest types and successions in relation to timber marking and forest management in California, silvicultural research and its applications (Dunning); forest planting (Siggins). During the last ten days of the month Director Kotok has been engaged on the District Board of Fire Review.

Kotok addressed the annual meeting of the California Development Association (The State Chamber of Commerce) on present and future program of the Station. The directors of the Association are vitally interested in the McSweeney-McNary Research Act and propose to press Congress for adequate annual national appropriations. The directors, representing some of the most prominent men in the State, consider forest influence studies of the utmost importance in California and desire that our Station give these studies first prominence.

On the request of the State Board of Forestry, Kotok appeared before them to outline the work of the station. A brief was prepared for use by the Board, showing the relationship of fires to run-off and erosion. The Board is requesting considerable increase in State appropriations for fire protection and research work by the Station.

Management

Management, as well as other projects, was interrupted the fore part of the month by an exceptionally bad fire situation. In connection with the week spent on the Angeles and San Bernardino forests assisting on large fires, Dunning took the opportunity to visit with Kraebel the influences work at Devil Canyon.

During the early part of the month Siggins completed progress reports on the Sequoia Methods of Cutting plots. These four plots were established in 1911 by S. W. Wynne. They include 40 acres of western yellow pine and sugar pine - white fir types on Sites I and II, with rather heavy reserved stands. The growth rate of the young and thrifty mature diameter classes is excellent but losses from death of overmature reserved trees have been severe, largely offsetting the values resulting from growth of the younger reserves. As a result the net volume production is very unsatisfactory.

Cover Type Map

Two crews have been in the field during the month, one in Santa Cruz County and the other in Santa Clara County. Of special interest was a western yellow pine type of several square miles wedged in between a redwood-Douglas fir type. The pine occupies a sand formation just east of the city of Santa Cruz. The area was logged about 40 years ago for box lumber and the present stand consists of culls and second growth. Cut-over lands in the redwood-Douglas fir type where burning was practiced in logging are now occupied by a Ceanothus brush or tanbark-oak - madrone woodland type, while similar areas where no burning was done have come back to excellent second growth stands of the original type.

Erosion damage in these redwood areas, due to the prevalent custom of clearing off the trees by burning or girdling to increase the areas available for grazing, is extraordinarily severe. Special attention is being paid to this phase, with photographs which will show clearly both the nature of the process and the disastrous results accruing from it. This striking evidence will greatly reinforce the strength of the Service position in respect to the relation between cover and erosion, for which the Station is building up the necessary mass of supporting data throughout this State, as well as the newer conclusions to which Lowdermilk's work is unmistakably pointing in respect to the major significance of the mulch cover and the mechanics of its functioning.

Southern California Work

Forest Influences Studies.- There are now available results on last winter's run-off and erosion from the Barranca area. This area of 177 acres, it will be remembered, comprises a small watershed on the "front" of the San Bernardino Mountains which was burned over in September 1925. Here during the first winter after the fire an enormous amount of erosion occurred. The present results show that even in the third year after the fire a moderate rainfall still brings down considerable quantities of detritus. Of the two "effective" storms of last winter, that of February 4 (rainfall 3.65 inches) produced a run-off of 13,040 cubic feet, of which 93 per cent by volume was water and 7 per cent solids. The storm of April 3 (rainfall 1.42 inches) produced a total run-off of 4,168 cubic feet, of which 85.5 per cent was water and 14.5 per cent solids. The maximum rainfall intensity was one-half inch in one hour on February 4 and the maximum run-off lagged but 15 minutes behind this surge of the storm. This rapid concentration of run-off waters reflects the present condition of the watershed, which comprises steep slopes, much bare rock and hard sub-soil, scant vegetation, absence of vegetative litter on the steep soil surfaces, well-defined drainage gullies formed by previous storms since the fire, and disturbance of exposed soil by animals and wind.

In September Kraebel had the pleasure of showing Director Demmon, of the Southern Forest Experiment Station, over our southern work. In the Los Angeles region they picked up Chapline, Detwiler, and Prof. O. L. Sponsler (University of California at Los Angeles) for an examination of the activities at Devil Canyon and for a conference with Dr. Taylor at the California Botanic Garden at Santa Monica. The Nursery and Influences study at Devil Canyon were also visited by the Forester, accompanied by Director Kotok, District Forester Show, and Supervisors Nash-Boulden and Elliott. The instruments used on the Barranca area last winter have all been placed in the hands of an expert to be over-hauled in preparation for the coming rain season.

Nursery.- At the Nursery Weaver has devoted most of his time to weeding, but also gave several days to revising the Station map, collecting seed, and assisting Lowdermilk in locating some new run-off plots.

Transpiration Studies.— Closely tying in with the forest influences studies and the uses of our cover type maps is a preliminary report to the Station by Dr. E. B. Copeland of studies which he has been making, in cooperation with us, of the transpiration of chaparral species. This study is attempting to give a quantitative measure of the transpiration of such species with a view to an ultimate appraisal of the relative watershed values of the various plant types, as measured by maximum mulch production and root soil binding, combined with minimum transpiration water losses. It makes use of an ingenious adaption of the cobalt paper indicator method. It supports, thus far, the findings of other recent investigators as to the relatively heavy transpiration from xerophilous shrubs, such as the Ceanothus and other chaparral and desert plants whose reduced, coriaceous leaves have been supposed to minimize transpiration; shows that the smaller, heavily cutinized sun leaves of such plants, in fact, transpire more water per unit area than the larger, thinner and less cutinized shade leaves of the same plants; and indicates strongly that trees such as oaks, etc., which often occur in the chaparral formation, are much more economical users of soil water than are the typical chaparral shrubs.

Planting

The Feather River Branch station has again suffered a change in the personnel of superintendent and caretaker by the resignation of Mr. Bower. The position has been temporarily filled by Mr. L. L. Hormay, a University of California forestry student who will remain until January 1. In connection with Siggins' trip to the station to give the instruction in planting at the Ranger School he spent some time with Hormay in getting the latter oriented in his work, also in making a land survey tie for the new planting area, running surveys for the new 2700-foot water supply pipe line which is so badly needed for the Station and in getting a supply of sand for the seed and transplant nurseries.

While at the Feather River Station Siggins discovered another mining claim on lands which are supposed to have been set aside for the use of the station. This brings up once more the very unsatisfactory status of our title to lands needed for permanent plots. One corner of the claim in question lies within a few feet of the edge of one of our western yellow pine thinning plots. While it does not actually encroach on any already established plot it may easily result in damage which would prevent the use of a large part of the area which the station is supposed to control for experimental purposes. A permanent solution of these difficulties is an urgent need for the safety of our experimental work.

Products

Heptane.- What time at the beginning of the month was not appropriated by preparation for the Ranger School, Hill used for the completion of report on this project; also a report for the District Forest Management office on the results of his inspection of the commercial tapping area in September.

Blue Stain.- Brundage's time was mostly occupied during the month with completing plans for this fall's experimental work at the Sugar Pine Lumber Company's plant at Pinedale, California. After creating a season of pandemonium in the Products office to arrange, almost without notice, for obtaining a large supply of Fungimors for the company, duty free as an experimental project, and to extend the experimental working plan to care for a suddenly enlarged program on their part contemplating the dipping of over a million feet of lumber, the Company as suddenly changed their mind again and decided to cut their program in half to fit the considerable amount of Fungimors which they already had on hand. This will be much more satisfactory to us. It will still constitute a considerable project, but will give opportunity to get more comparably satisfactory data on some other stain preventatives such as Neckyan, of which it is hoped to be able to have a supply by the time it is needed, and several new compounds prepared by the DuPonts. It is expected that Pathologist Lindgren of the Southern Forest Experiment Station will visit the experimental work about the beginning of November.

Lumber Census.- A preliminary statement on the 1927 cut of California and Nevada was finally gotten through the approval of the Census Bureau and is being issued. This shows a total cut for 1927 of 2,070,096 M. feet, which is about 118 million or 5.4 per cent smaller than in 1926, but 27 million, or 1.3 per cent, larger than in 1925. The main items of the 1927 cut consist of western yellow pine 37.5 per cent, redwood 27.5 per cent, sugar pine 13.3 per cent, Douglas fir 11.1 per cent, and white fir 9.1 per cent.

For the first time in recent years the cut of Douglas fir in California surpassed that of white fir. This might be supposed to represent the increasing tendency of the industry to leave its white fir in the woods on account of the lack of profit in it, which has recently so much agitated the California pine industry, as well as annoyed the Forest Service on account of the insistent demand for the same policy in national forest timber sales. This may be partially true; but it is to be observed that while the 1927 white fir cut is some 22 per cent less than that for 1926, the cut of the latter year, when the cry of the industry was not less loud than now, was abnormally high, being some 8 per cent larger than it was in 1925. On account of fluctuations in total cut, a truer index is perhaps the percentage of white fir in the total cut of the pine region. This has decreased continuously and rather slowly, be-

ing 15 per cent in 1925, 14.7 per cent in 1926, and 13.4 per cent in 1927. The reversal of rank in proportion of total state cut in 1927, between white fir and Douglas fir, putting the latter ahead of the former in this year, is due in considerable measure to a sharp reversal of trend between those species in the redwood region (white fir receding from 3.6 per cent of regional total in 1926 to 1 per cent in 1927; Douglas fir advancing from 15.7 per cent to 18.0 per cent). In that region there is no sharp issue between these species and the fluctuations in cut probably represent nothing more than a difference in composition of the stands encountered in the two years. It does not appear, therefore, that the California pine lumbermen are refraining from cutting white fir on their own lands (from which comes 86 per cent of their cut) to such an extent as their outcry would lead one to believe; or, on another count, that the much heralded reduction of total lumber production in 1927 was at all as serious as it was promised to be.

Entomology

Person and Struble, in company with Messrs. Miller and Wagner of the Palo Alto Station of the Bureau of Entomology, spent a few days on the Cascadel area of the Sierra National Forest. The Cascadel sample plot was cruised and a 640 acre check area was laid out and cruised. This check area will be cruised annually for the purpose of following the infestation cycle in the Northfork area. We already have a record of the last four years infestation for this plot. The experimental trees and sample plots used in attraction and fire studies in this area from 1924 to 1927 were also examined.

Biology

During October further attention was given to rodent problems on the Modoc. Opening of lumbering operations on the Badger Township and adjacent privately owned timber offers an opportunity for investigation of the effect of cutting, in varying degree, upon numerical fluctuation in rodent population. Following cutting in certain sections rodents appeared to increase to such numbers that they became factors affecting regeneration. Porcupines in some parts of the United States are now more numerous and destructive on cut over areas than on adjacent virgin stands of timber, but no information is available regarding conditions prior to or immediately following cutting, twenty-five to forty years ago.

On the unit selected on the Modoc the seasonal movement of porcupines is not of great range. The summer is spent along the streams where succulent vegetation is abundant. In October they were found

occupying dens along the rims of adjacent mesas, or, where dens were not available, using junipers as "rest trees" in which to spend the day. Very few of the animals were found, nor appreciable damage or other signs to indicate their presence, in the denser pine growth to the north. Boundaries of heavy infestations as they now exist were defined. This concentration of porcupines in the Modoc region around streams, as against the higher timber areas, where cutting is not yet a factor, is in interesting contrast to their wider spread of activity and travel in other regions, such as Colorado and the Southwest. There is apparently a possibility that cutting in this Modoc region will produce a similar spreading out of infestation. If this proves to be the case, porcupine damage to reproduction could easily become a serious factor in the reforestation of the extensive cutover area now to be created. It will be interesting to watch this problem and to determine the vegetative changes on the lumbered area which contribute to resulting shifts in porcupine population.

Attention was also directed to control methods in the interest of operations now being carried on cooperatively by the Forest Service and the Biological Survey. Placing poisoned salt in dens used by porcupines may give best effectiveness if done during the fall and early winter. Since the porcupines of this region do not make general use of dens during the summer, poison so placed may be consumed or brushed away by other rodents before porcupines again visit the dens in the fall. Control can best be carried on during the summer by placing the poison in suitable trees on the summer feeding grounds. Winter poisoning through establishment of similar stations in frequented junipers offers possibilities, but is not advocated until further determination can be made of the possible counteracting effect of a pine or juniper diet upon the effectiveness of strychnine as a poison.

A preliminary survey of the area was made with a view to carrying on a ten-year study of the biotic relationships; the changes in these relationships brought about by cutting; and particularly the response to these changes by animals that are of interest to the forester.

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PACIFIC NORTHWEST FOREST EXPERIMENT STATION

Early in the month Kolbe made the annual examination of the Whitman Mc-101 and Fs-101 plots, and during the latter part of the month he and Isaac have been making the round of the Douglas fir natural reproduction plots in western Washington which required another periodic examination this fall.

Field Assistant Robertson has been engaged in drying down and computing moisture content of the 287 soil samples he took this season. At the same time he has been compiling his very extensive data on physical site factors that have a bearing on the germination and survival of Douglas fir reproduction in the upper Wind River Valley.

The taxing of reforestation lands is a very live subject in Oregon and Munger has spent considerable time at meetings, both formal and informal, where the principles that should guide forthcoming legislation were discussed. The Property Tax Relief Commission appointed by the last Legislature has taken an active interest in the subject and held a hearing, and the recently organized forestry committee of the West Coast Lumbermen's Association has also had it up for discussion.

At the Pacific Logging Congress the Director gave a paper leading off the discussion of slash disposal in western yellow pine. He recommended for ordinary conditions an elastic application of the strip-burning plus protection method. At the Congress a half day was devoted to a discussion of small vs. large logs in pine operations which aroused much interest.

The Forest Research Council met at luncheon during the Logging Congress, in conjunction with the Forestry Committee of the Portland Chamber of Commerce, to hear Dr. Haven Metcalf speak on the European larch canker disease. A resolution was passed urging appropriations for the Department of Agriculture to stamp out the disease before it spreads. A subcommittee of the Council consisting of Deans Peavy and Winkenwerder and Munger met the next day to consider ways by which the States might be stimulated to have a larger part in the research program of the region.

McArdle's Work in Absentia - McArdle has spent several days this month in further analysis of the Douglas fir slash disposal data and in writing a preliminary report on this study which may be used in the co-operative Grays Harbor County report. Now that the first press of his school work is past he plans to drop other work and get at the revision of the Douglas fir yield manuscript.

Wind River Branch - Simson spent practically his entire time, aside from current routine observations, on the burning phase of the snag falling study. The snags were bored for burning in May, hence they had the entire summer to dry out. But even so, this fall a number of them were found to be too wet to burn. About ninety snags have been ignited. After trying a wide variety of ignition methods with indifferent success, charcoal ignited by an inch of railway fusee was finally settled upon as the most satisfactory.

Prof. A. A. Knowlton of the Physics Department of Reed College visited Wind River, in the company of the Director, to give his counsel on the physics problems of falling snags and to see our other fire research activities.

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NORTHERN ROCKY MOUNTAIN FOREST EXPERIMENT STATION

The annual fall examinations of the methods-of-cutting and methods-of-reproduction permanent sample plots, and the study of old timber sales were the dominant Station activities during October.

Weidman supervised the beginning of the work on the permanent sample plots, leaving it, toward the middle of the month, to be completed by Gisborne and two field assistants. Although this was largely extra work for the present staff, being part of Marshall's former schedule, practically all of the jobs listed were completed. One field assistant, J. W. Zehnder, the Swiss forester who is touring the country studying our forests and research methods by actual participation in the work, is now engaged at our Missoula headquarters compiling these records and checking the completeness of the file for each plot. In some cases there has been an absence of establishment reports, maps, standard-sized compilation sheets, etc. Much of this lack has been due in the past to insufficient assistance, either at the time of installing the plots or after the field season when the annual office work should have remedied these deficiencies. A strenuous attempt is being made this year to bring all this material up to date and in standard form, but it is not expected that finances will permit completing all of it.

In connection with the hemlock problem confronting forest administration in this region, mentioned in last month's report, Haig and his crew devoted about two weeks' study to the recovery and degree of decay of small hemlocks remaining often too abundantly on timber sale areas after cutting. Almost no dependable evidence has been available in the past to determine when and where it was best to slash or girdle all the remaining hemlock, or to leave it with the hope that at least the pointed-crowned and apparently promising trees would accelerate in growth and produce sound lumber. Specifically the questions are:

1. Does hemlock accelerate in diameter and height growth after release? At what rate is it now growing?
2. Is this understory hemlock sound?
3. What sort of reproduction could we reasonably expect if this hemlock were slashed?

To obtain some measurements on these points two 18-year-old cuttings on the Coeur d'Alene Forest were investigated. The hemlock stands generally consisted of pointed-top trees averaging about 6" D.B.H. and 25 to 30 feet tall. On each of these areas sample plots were installed, the original and the residual stands accounted for, and all understory hemlocks, between 4 and 10 inches D.B.H., were felled, sectioned for height growth, and increment cores taken. The findings were briefly as follows:

1. Ninety per cent of the hemlocks felled showed accelerated diameter growth, and 54% showed a slight acceleration in height. The aver-

age diameter growth is now 1.4 inches per decade, while the present height growth is 6.9 feet each 10 years. Before liberation these rates were 0.8 inches and 6.0 feet respectively.

2. Of all the hemlocks felled, 40% had some rot. Of all the felled trees which showed signs of stem injury in the past, 81% were decayed to some extent, while 22% of the uninjured stems showed the presence of rot, thereby rather definitely relating decay to stem injury in understory hemlock, and thereby indicating an excellent criterion for selection in slashing such trees.

On another area, now being logged, about 58% of the understory hemlock showed rot of some sort. This figure is based on borings in 125 trees selected at random.

3. A clear-cut area, immediately adjacent to the site on which the residual hemlock was studied, served as a rather typical example of the reproduction that can be obtained in this type when the hemlock is removed. On this clear-cut area 95% of the surface was satisfactorily stocked with healthy, vigorous white pine from 6 feet to 14 feet in height. Studies on other areas throughout most of the white pine type show that white pine almost invariably reproduces well and grows vigorously on clearcut, lower north slopes. It is on such sheltered aspects, which are excellent white pine sites, that the understory of hemlock commonly occurs, and constitutes a serious silvicultural problem. The problem is most acute on the Coeur d'Alene Forest.

The practical value of this information is that there are two schools of thought in this District as to the treatment of such stands of hemlock understory. One is that the hemlock will never make, or probably only doubtfully make, a profitable return cut. The adherents of this opinion propose slashing and burning the hemlock in order to get sufficient light on the ground for white pine reproduction. The other school believes that this hemlock represents growing timber with 30 to 50 years' start towards a future crop, and, therefore, to remove it in favor of possible white pine reproduction is not good forestry practice. Any decision either way is influenced by the high cost of slashing hemlock. Where this has been tried on the Coeur d'Alene Forest the cost amounted to approximately \$20 an acre.

Toward the end of October Senior Forest Ranger J. B. Thompson reported at the Priest River Branch Station to take charge of the work there as Kempff's replacement. Thompson joins the Station staff with very good administrative training and experience, and with a keen interest in research. He was immediately introduced to the rather large volume of maintenance and improvement work needed at the Priest River branch, and was initiated into quadrat and seed-trap examinations. As he had previously made phenological observations at his former ranger station, as a part of the District program, Thompson was already familiar with that work.

SOUTHWESTERN FOREST EXPERIMENT STATION

The end of October saw the field season drawing to a close. A week or two at remeasuring sample plots, and then begins the compilation of data and writing of reports which will hold sway until April. The San Francisco peaks have been snow-capped for nearly a month. Each storm brings the mantle of white a little lower down the slopes, and soon it will be spreading out over the plateau.

In the examination of a series of western yellow pine cutting plots established fifteen years ago, the outstanding feature is the superiority of natural reproduction on the seed-tree cutting as compared with group selection and shelterwood methods. The number of trees per acre over 11 inches dbh in 1919 was 3.6, 14.2 and 20.1, respectively. (Actually the shelterwood method amounts to nothing more than a light group selection cutting). Of trees over 20 inches dbh the corresponding numbers per acre were 2.7, 3.8 and 7.0. Nearly all the present reproduction is of 1919 origin. Counts in 1920 gave 2825 seedlings per acre for the scattered seed-tree area, 3940 for the group selection, and 7875 for the shelterwood. These numbers, it should be noted, are very nearly in proportion to the number of trees over 20 inches dbh. Annual counts on permanent plots and strips up to 1926 indicated the highest percentage of survival on the seed tree area. To present an adequate picture at this time requires a detailed survey on a large scale. Careful observations, however, point convincingly to the scattered seed-tree area as being better stocked than the others from the standpoint of even distribution and size of seedlings.

Before concluding offhand that scattered seed tree cutting gives the best reproduction in western yellow pine, it is well to ask ourselves whether the method of cutting constitutes the only essential difference between the areas. This question is difficult to answer. To all appearances, the sites are similar except that the scattered seed tree area slopes gently to the north while the other two slope gently to the south. It is doubtful whether this is an important factor because in this region south aspects, unless of steep gradient, are fully as favorable to reproduction as northerly aspects. All three areas were severely overgrazed up to 1919 when they were fenced, and since then only very light grazing has been permitted. It is definitely known that grazing damage is not a factor within the fenced areas. Grass competition is, if anything, most keen on the scattered seed tree area, but since this did not develop until the seedlings were about five years old, it has not been a deciding factor.

Granting that method of cutting is the deciding factor, how has this brought about the now evident relation in survival and growth? In the first place, the heavy cutting on the scattered seed tree area should

result in less tree competition than on the other areas. This is obviously the case. The groups of blackjack which numerically make up the greater portion of the stand left on the other two areas are conspicuously absent from the seed tree area. A large quota of the originally greater numbers of seedlings on the group selection and shelterwood cuttings were on the north and east sides of tree groups where shade favors germination but interferes with later development. It is well known that practically no seedlings survive their fifth year within 30 to 50 feet on the north or east side of a large group of older trees. The survival which really counts is mostly beyond the 50 foot zone, and the proportion of area falling into this class is much higher under the seed tree method than under the other methods of cutting. Another factor in favor of the seed tree method is the increased area in "stump patches" or groups of stumps. A stump patch corresponds roughly to the area shaded by the group of trees before cutting. These patches are usually conspicuous by their fine stands of large seedlings. From the standpoint of tree competition, one has a right to expect better reproduction under the scattered seed tree method of cutting than under the other methods, provided that enough seed is borne by the smaller number of seed trees. There is another angle to the competition question. Bunch grass, particularly *Fistula arizonica*, is favored by heavy cutting. If overgrazing had not held the grasses in check up to the year of germination we might have a different story to tell. Incidentally, the experience here points out the way to employ grazing as a silvicultural measure. As long as no seedlings have started, let the stockmen overgraze 'their hearts' content; when a good catch of seedlings appears, move the stock.

Even if the apparent merits of the scattered seed tree method are upheld by further investigation, this method could not be recommended in general practice. Obviously, it would be poor business to cut half-grown trees in order to make room for seedlings. Moreover, the scattered seed tree method would eventually lead to even-aged stands which are of doubtful applicability in District 3. The method would, however, prove exceedingly practical under certain conditions, as in overmature stands where few suitable seed trees are available, or where eradication of mistletoe or other pests calls for sacrificing immature trees.

What appeared to be a leaf disease on seedlings and saplings caused some concern for a short time this fall. Many of the leaders were partially stripped of needles. Some of the needles which still persisted were twisted at the base in such a way as to present an abnormal appearance. An easy solution would have been to charge the defoliation to sheep, except that it occurred within fenced areas and on trees entirely beyond the reach of any livestock. An examination by District Pathologist Long failed to disclose the presence of parasitic organisms. When he suggested hail as a possible cause, the veil of mystery dropped because it was known that unusually severe hail storms had swept several of the areas affected.

Thirty pounds of salt and strychnine have been placed in trees on and around sample plots as a protection against porcupines. The method employed is that developed by Horn. These same areas and additional ones were baited under Horn's direction last year with excellent results from the standpoint of both reduction of damage to trees and casualties in the ranks of their enemies.

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MANUSCRIPTS

District 2

Effect of Thinning in Jack Pine Plantations, Jacob Roeser, Jr.

Experiments in the Silvicultural Control of Natural Reproduction of Lodgepole Pine in the Central Rocky Mts. C. G. Bates and H. G. Hilton.

Northern Rocky Mountain

Western Yellow Pine Living 35 years after Girdling. Robt. Marshall. (Am. For. and For. Life).

Relation of Amount of Seed Sown and Density of Seedlings to the Development and Silviculture of Forest Planting Stock. W. G. Wahlenberg. (To J.A.R.)

Southern

A More Scientific Method of Experimental Thinnings. F. I. Righter (For Jour. of For.)

Appalachian

Forest conservation in the Southern Appalachian region, with special reference to power development and the protection of stream flow. E. H. Frothingham, (address at Southern Appalachian Power Conference, Atlanta, October 8.)

Pacific Northwest

From fern patch to forest in sixteen years. T. T. Munger (For lumber trade journals)

What is the most economical and efficient way of slash disposal in pine operations? T. T. Munger (Pacific Logging Congress)

IN PRINT

Boyce, John S. A conspectus of needle rusts on balsam firs in North America. Phytopathology, Aug. 1928.

Kelley, A. P. Early forest succession in Pennsylvania. Forest Leaves, October, 1928.

Meyer, W. H. Understocked Stands. Jour. For. Oct. 1928.

McCarthy, E. F. Forest problems in the hardwoods. Proc. Southern Forest Congress, 1928.

Wahlenberg, W. G. Experiments with Classes of Stock Suitable for Forest Planting in the Northern Rocky Mountains. (J.A.R., June 15, 1928).

Zon, Raphael, and
J. L. Averell The Effect of Drainage on Forest Growth.
Agricultural Engineering, June, 1928.

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Director Winslow and Mr. Heritage of the Forest Products Laboratory
Visit the District

The logging and mill operations of the Anaconda Copper Mining Company out of Missoula, Montana, and the Potlatch Lumber Company at Potlatch, Idaho, were visited by Director Winslow and Mr. Heritage, Chief of the Pulp and Paper Section, on their brief stay in this District during early October. District Forester Morrell spent the day with Mr. Winslow and Mr. Heritage at the A.C.M. camps and Mr. Bradner met them in Spokane and accompanied them on their trip to Potlatch. The A. C. M. Company is operating in the western yellow pine type of western Montana, while the Potlatch Company's holdings are in the western white pine type of north Idaho. Both Mr. Winslow and Mr. Heritage were much interested in the amount and kinds of material left on the ground after logging and in the amount and character of the sawmill waste.

Bradner Detailed on Fire

Bradner returned to the Office October 6, after having completed a week's detail on the fire line in the Palouse Division of the St. Joe National Forest in Idaho. These late fires, three in number, occurring on the Palouse Division of the St. Joe were the direct result of logging slash fires starting on private lands outside the Forest. They occurred at the same time the large Slate Creek fire on the main St. Joe was burning out of control.

Woods Waste Survey

Mr. I. V. Anderson spent the major portion of October in the field finishing up the collection of data on the Woods Waste Survey part of the Woods Utilization study. During this field trip work has been concentrated on cleaning up the survey in the western white pine and western yellow pine types. During this field season the logging operations of more than fifteen companies have been visited and considerable valuable data on the amount, kinds and character of the timber wasted in logging have been collected. Plots were tallied both on Forest Service and private cutting areas, on stands cut during the winter and during the summer, and on areas logged by different methods and equipment.

Third Tree-to-Mill-Green-Chain Study in Western Yellow Pine Started During October

The third of a series of logging and milling studies started during the summer to determine the cost of production and the value of the products from western yellow pine trees of different sizes was started on October 26. This study is being made in cooperation with the J. Neils Company of Libby, Montana. Mr. Bradner and Mr. Anderson of the Office of Products are being assisted in the field by Mr. Webb, D-1 logging engineer, and three Forest officers from the Kootenai National Forest. The Company is furnishing the lumber grader for the mill end of the study.

The work is to be done in the western yellow pine type. The Company is logging with caterpillar tractors and the timber is being skidded to the landing in tree and half-tree lengths. Logging and sawmill costs are being kept for each individual tree brought in during the study. Descriptions of the standing tree, stand per acre, and the slope and distance of the "cat" trails from tree to landing are also recorded. A piece tally by grades and sizes is made at the mill green chain by individual trees. Data on approximately a quarter of a million board feet of timber will be obtained during the study. The field work should be completed by November 10.

Wood Preservation

Two inquiries requiring the compilation of considerable data were handled by Whitney during the month.

The first of these was made by Mr. A. W. Cooper, Secretary-Manager of the Western Pine Manufacturers Association, who desired information concerning the relative resistance to penetration with preservatives and comparative durability of Coast fir, Inland Empire Douglas fir and western larch ties. This request was received through Mr. S. V. Fullaway of the National Lumber Manufacturers Association District Office at Portland.

The information furnished included a discussion of results obtained at some of the Inland Empire tie treating plants, summarized records on the Montana test tracks of the Northern Pacific Railway Company and tables showing the records of completed service tests of treated and untreated ties of these species in a number of other test tracks.

The other inquiry referred to was received through the District Office of Grazing in a letter from Mr. C. E. Rachford, Assistant Forester. Information on fence post treatments and treating costs, needed in connection with range improvement work, was requested. The collection of data prepared by Whitney was turned over to the local Office of Grazing for transmittal to Mr. Rachford.

Lumber Prices and Movement

Av. Mill-Run Prices	Annual 1926	Annual 1927	First Q. 1928	Second Q. 1928	September 1928
Idaho White Pine	\$35.86	\$30.17	\$30.20	\$31.00	\$30.47
Western Yellow Pine	25.17	24.19	26.55	25.52	24.71
Larch-Fir	18.19	16.38	17.60	18.23	19.72
White Fir	17.41	16.80	17.89	17.35	18.37
Spruce	23.39	25.67	24.35	21.21	24.15

Shipment and Cut	1927	1928
Shipment	139,293	164,031
Cut	134,059	154,454
Shipment for 9 months	1,206,350	1,325,163
Cut for 9 months	1,175,730	1,220,957

Study of Compression Wood

Mr. H. Y. Pillow of the Forest Products Laboratory arrived in this District on October 8 and spent about three weeks in the collection of material both from woods operations and manufacturing plants for shipment to the Laboratory.

Samples showing compression wood in Idaho white pine were obtained at the Ohio Match Block plant, Spokane, Washington, and in 1500 board feet of material cut at this company's Burnt Cabin logging operation in the Coeur d'Alene Forest. Some lowland white fir was collected on the Little North Fork of the Coeur d'Alene River. While in the western part of this District Mr. Pillow also did some work at the Panhandle Lumber Company's mill at Spirit Lake, Idaho.

During the period from October 21 to 26, western yellow pine, Douglas fir and western larch samples amounting to a total weight of 7,000 pounds were collected from the Anaconda Copper Mining Company's Blackfoot logging operation. When this work had been completed, some time was spent in the sawmill and planing mill at Bonner, Montana.

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OFFICE OF FOREST PRODUCTS - District Six

The possibilities of an increasing use of Pacific Northwest woods for paper pulp received more than the usual amount of attention in October.

Winslow and Heritage Visit Oregon and Washington

To secure firsthand information of conditions on the Pacific Coast, with particular reference to pulp and paper manufacture, Mr. C. P. Winslow, Director of the Forest Products Laboratory, and Mr. C. C. Heritage, In Charge, Section of Pulp and Paper, spent a busy two weeks in the Douglas fir region in October.

Their general objective was to obtain a broad view of the Pacific Coast pulp and paper industry, present and prospective; the source and character of its pulpwood supplies, existing and potential; and its immediate and more fundamental problems, economic, technical, or what not. Specifically, they desired to determine the Pacific Coast species on which they can most profitably concentrate pulp and paper research at the Laboratory, including the form in which the wood would be available to the industry, whether in virgin or second-growth stands, logs or cordwood, logging or mill waste or both, and the like.

Accompanied by Gibbons, Winslow and Heritage visited most of the pulp and paper plants in Washington, including the San Juan Pulp Manufacturing Co., Bellingham, Everett Pulp and Paper Company, Everett, Rainier Pulp and Paper Co., Shelton, Washington Pulp and Paper Corporation, Port Angeles, National Paper Products Co., Port Townsend, Grays Harbor Pulp Co., Hoquiam, and the Longview Fibre Co., Longview.

These seven plants alone give a good cross section of the Pacific Coast pulp and paper industry, regardless of the angle of approach. They serve to illustrate the four pulping processes, mechanical, sulphite, soda and sulphate, as practiced on the Coast; bleached pulp is produced at two of them. At one or the other of the seven plants Sitka spruce, western hemlock, white fir, black cottonwood or Douglas fir is utilized, entirely or in part. As to finished products, they present a wide range, including bleached and unbleached sulphite pulp, sulphate and sulphite wrapping, writing and book, newsprint, board, etc.

While the Laboratory visitors naturally looked into the technical phases of production, they were particularly interested in recent develop-

ments of the region in the utilization of mill waste for pulp. Six of the seven plants set out in the above are using mill waste, material constituting a large part of their pulpwood supply; and they do not include all the plants of Oregon and Washington that are utilizing mill waste for pulp.

The pulp plant located at Bellingham, where sulphite pulp for shipment to the Atlantic Coast and other distant markets is made largely from waste hemlock and spruce box trimmings, is typical of one class of waste utilization. This plant is located between and near two sawmills operating box factories. The waste wood from the two box factories is delivered to the pulp plant by auto truck, box trimmings from a third factory being hauled 22 miles by rail. Dumped into a trough, the trimmings are conveyed to a huge bunker. The waste wood is then moved by gravity to the wood room, where it is converted into pulp chips; black knots, bark and other defective material is sorted out and used for fuel. Thus every piece of wood, no matter how small, is utilized.

At Shelton, on Puget Sound and only a few miles from the southwest boundary of the Olympic National Forest, the Laboratory visitors had a further opportunity to see the utilization of mill waste for pulp on a large scale, also the great possibilities of integrated wood-using industries. Two sawmills, a Douglas fir and a western hemlock mill, each under separate ownership and management and each producing about 275 thousand feet of lumber per 8-hour day, stand side by side on tidewater near an electric power plant jointly owned by the two lumbering companies. Immediately to the left of the hemlock sawmill, but representing an entirely separate unit so far as ownership and management are concerned, is a 150-ton sulphite pulp plant. Refuse from the sawmills, in hogged form, serves as fuel for the power plant, with the latter supplying not only the light and power requirements of the sawmills and pulp mill but also a large part of the light for the county. A large proportion of the hemlock mill waste is converted into pulp chips at the sawmill, with the chips conveyed to the pulp mill at the very minimum of cost and trouble; only the rotten material goes to the burner. Hemlock mill waste that formerly was utilized for lath is now converted into pulp chips by this and other hemlock sawmills of the region. This mill, moreover, is converting its No. 3 Common hemlock lumber into pulp chips, a practice that is being taken up by other mills; it is now said that one Puget Sound mill is considering the pulp-chipping of No. 2 Common hemlock lumber.

The time that Winslow and Heritage could spare for sawmill operations was devoted largely to Mill "C", Weyerhaeuser Timber Company, Everett, and the West Unit of the Long-Bell Lumber Co., Longview. The former mill, rigged with a band headsaw, two gangs, a slab resaw, two trimmers, and the usual planing mill equipment, operates entirely on hemlock logs and has a capacity of about 150 thousand feet per 8-hour shift; utilization, as related to lumber manufacture, is especially

close. But it was not the excellent lumber manufacturing facilities of this mill that especially interested our Laboratory visitors but rather the simple and effective layout for sorting, barking, and pulp-chipping mill refuse which only a year or so ago found its way to the burner. The company took advantage of the old improvements, so that the mill refuse in the different stages of conversion into chips moves downward by gravity, with the chips shunted into scows for water transport of a hundred or more miles to the consuming pulp mill.

At Longview they saw one of our Douglas fir mills converting logs 60 feet in length and 5 feet in diameter into a multiplicity of lumber forms and sizes at the rate of 1,000 board feet per minute, but accompanied by a constant and amazingly large flow of potential pulpwood (possibly one-half cord per minute) to the burner. Here, if not before, full realization must have come to them that in the Douglas fir mill waste there is material ample for the production of a very large volume of paper pulp, also that a concentrated search for better methods of utilizing Douglas fir for paper is fully warranted.

Just how much Douglas fir mill waste is available for paper manufacture, in addition to similar waste from Sitka spruce, western hemlock, and white fir is difficult to estimate; our local Forest Products office has done no recent work in this general field, a line of work we plan investigating systematically and well shortly. Not all of the mill waste, potential wood pulp material, is now available for pulp manufacture, a condition that may continue for a long time to come. In the case of many mills of the region the burner has become idle equipment; mill waste that formerly fed the burner is now disposed of, in the form of slabs, edgings, block wood, hogged wood, and the like, for fuel, with a large part of the so-called waste supplying the power requirements of the plants themselves. Varying amounts of the slabs and edgings are also converted into lath or some similar products. Again, the quantity of mill waste, together with its availability for pulp and other uses, turns to no small extent on the size of the individual sawmills, their particular location, the character of their manufacture, etc. Along with all this is the absence of satisfactory records, tied into an accurate unit of measurement.

One hemlock mill, not engaged in lath production, finds that its mill waste is yielding 110 cu. ft. of pulp chips per M feet of hemlock lumber produced, with about the same amount of hogged fuel; another hemlock mill finds that their mill waste is yielding 80 to 90 cu. ft. of chips per M feet of lumber produced. Both mills are producing No. 3 Common lumber, with the result that no trimmings to raise their mill lumber cut to No. 2 Common and Better are included in the pulp yields quoted.

Work previously done by this Office suggests that in the production of a thousand feet of rough green Douglas fir lumber mill waste equivalent to and suitable for about 140 cu. ft. of pulp chips and hogged fuel

results, or about 70 cu. ft. of pulp chips and 70 cu. ft. of hogged fuel; because of a thinner bark the volume of hogged fuel would be somewhat smaller in the case of western hemlock, white fir and Sitka spruce.

Of the estimated 70 cubic feet of hogged fuel, possibly 50 cubic feet is utilized by the sawmills themselves in connection with their power requirements. On this basis 70 cubic feet of pulp chips and 20 cubic feet of hogged fuel, per M feet of lumber output, are now available in the Douglas fir region, assuming that none of the mill waste goes into lath, slab fuel wood, etc.; as previously indicated, in the case of many mills no mill waste is now actually available for pulp manufacture, what with the fact that it is being disposed of for fuel and that only a price consideration will make it available for pulp.

In 1926 the lumber cut of the wood pulp species in the Douglas fir region of Oregon and Washington was, in thousand board feet:

Douglas fir	8,243,153
Western hemlock.	1,339,587
Sitka spruce	310,239
White fir	15,249
Total	9,908,228

Using these figures, the total amount of mill waste resulting in the sawmills of the Douglas fir region of Oregon and Washington, per annum, in units of 200 cubic feet, possibly is approximately as follows:

<u>Species</u>	<u>Units of pulp chips</u>	<u>Units of hogged fuel</u>	<u>Total units</u>
Douglas fir	2,885,104	824,315	3,709,419
Western hemlock	458,855	133,959	602,814
Sitka spruce	108,584	31,024	139,608
White fir	5,337	1,525	6,862
Total	3,467,880	990,823	4,458,703

The estimate is based on 70 cubic feet of pulp chips and 20 cubic feet of hogged fuel per thousand feet of lumber output. It is not possible, as indicated, to give the percentage of this material that is now sold for heating and power generation; that it is high cannot be questioned. Nor can one say what price consideration would result in a large portion of it being converted into pulp chips.

Accepting the ration of two units of chips for each ton of manufactured pulp, the mill waste, as set out above, would be sufficient, were it actually available, to produce well toward a theoretical maximum of two million tons of pulp annually, roughly 1/6 from Sitka spruce, hemlock and white fir and 5/6 from Douglas fir.

Unfortunately, the amount of Douglas fir used for pulp, whether in log, split or mill-waste form, is very small. The Everett Pulp and Paper Company, Everett, use a percentage of Douglas fir with black cottonwood, with the soda process, in the production of certain grades of book and writing paper. And four other plants of the general region use varying percentages of Douglas fir with western hemlock in the production of kraft papers; operating on straight Douglas fir an unsatisfactory paper is secured. How to use Douglas fir in the profitable production of a satisfactory paper is unquestionably one of the big economic and forestry problems of the Pacific Northwest.

Working south from Bellingham Winslow and Heritage spent a day at the logging camp of the Sauk River Lumber Company, Snoqualmie National Forest. Powerful machinery possibly is the most prominent feature of this operation (as is the case with most other camps in the Douglas fir region), with the investment in such equipment strikingly large; each of four yarding units cost around \$60,000, not taking into account the additional investment of \$400,000 in the twenty miles of railroad and \$80,000 in three locomotives. The timber is very large, the ground rough, rugged and covered with brush. The logs, some of them scaling not far from 10,000 board feet, are dragged with great dispatch over the ground or swung down steep slopes and over canyons on overhead cables. Working under such conditions and with such methods and equipment (the best that has so far been developed), a great deal of wood waste results; a survey showed that about 25 thousand feet of sound wood, of cordwood size and larger, per acre, was left after logging in this camp; potential pulpwood left to rot or what is still worse to possibly feed a future forest fire.

Woods waste of a somewhat better character for manufacture into paper was seen at the operation of the Polson Logging Company, Olympic National Forest; the timber cut by this company contains a relatively high percentage of western hemlock and Sitka spruce.

Working out from Portland, Heritage, accompanied by Hodgson, visited the plants of the Crown-Willamette Paper Company at Canas, Washington and West Linn, Oregon, the Hawley Pulp and Paper Company, Oregon City, Oregon, the St. Helens Pulp and Paper Company, St. Helens, Oregon, and the Columbia River Paper Mills, Vancouver, Washington. In this group of mills is included the bulk of the newsprint production of Oregon and Washington; kraft papers are produced at two of the mills. In the case of the Vancouver plant, complete integration of lumber and paper production obtains, the lumber and pulp and paper mills being integral parts of one plant.

Both Winslow and Heritage made the trip to the Wind River Experiment station with Director Hunger of the Pacific Northwest Forest Experiment Station. The two Directors also visited the School of Forestry, Oregon

State Agricultural College; our two Laboratory visitors had previously conferred with Deans Winkenwerder and Benson at the University of Washington, an incident of which was the plan for Heritage to return to Seattle to take part in the paper conference at the University referred to later.

What proved to be an outstanding open dinner meeting of the North Pacific Section of the Society of American Foresters was given in Portland in honor of Messrs. Winslow, Heritage and Shepard, their talks furnishing the instruction and entertainment of the evening.

Pulp and Paper Conference at the University of Washington

The first formal gathering of members of the Pacific Northwest pulp and paper industry was held at the University of Washington, Seattle, with both Mr. Heritage of the Laboratory and Mr. Hodgson of our local Products Office reading papers. The object of the conference was to discuss the question of cooperation of the industry with educational and research institutions. The meeting, held under the auspices of the schools of Chemical Engineering and of Forestry of the University, was attended by about 75 men who were mostly technicians and executives of the pulp and paper industry.

A very interesting as well as instructive program was presented which was participated in by a number of men who are experts in special lines of work connected with the pulp and paper industry of the Northwest.

The program presented at the conference follows:

Address of Welcome

President M. Lyle Spencer, University of Washington.

Reforestation as a Means of Pulp Wood Supply

J. L. Alexander, College of Forestry, University of Washington.

Taxation in Relation to Reforestation Policy

B. P. Kirkland, College of Forestry, University of Washington.

Logging Waste for Pulp Wood

A. H. Hodgson, U. S. Forest Service, Portland, Oregon.

Sawmill Waste for Pulp Wood and Fuel

Col. W. B. Greeley, West Coast Lumbermen's Association, Seattle.

The Cooking of Douglas Fir with Sulphite Solution

W. L. Beuschlein, Department of Chemical Engineering, University of Washington.

Heat Balance in the Recovery Room of a Pacific Coast Sulphate Mill
C.P.R. Cash, Cascade Paper Company, Tacoma, Washington.

Mill Research

Vance Edwards, Northwestern Pulp & Paper Company, Portland, Oregon.

Mill Control

Dr. E. R. Richter, British Columbia Pulp & Paper Company, Port Alice,
B. C.

Steam Accumulators

B. T. McMinn, Department of Mechanical Engineering, University of
Washington.

Radio Control of Moisture

A. V. Eastman, Department of Electrical Engineering, University of
Washington.

The Relation of the U. S. Forest Products Laboratory to Pulp and Paper
Industry

C. C. Heritage, in charge Section Pulp & Paper, Madison, Wisconsin.

Training Schools in Pulp Mills

D. B. Davies, Rainier Pulp & Paper Company, Shelton, Washington.

General Discussion of this Topic Opened by Myron Black, Inland Empire
Paper Company, Spokane, Washington.

A banquet was held during the evening at the Wilsonian Hotel for those in attendance at the Conference after which the matter of forming a local or Pacific Coast section of the Technical Association of the Pulp and Paper Industry was discussed. The meeting was enthusiastic over the formation of such an organization and a motion favoring it was made and passed by those present. It was decided to place the matter before the entire industry of the Pacific Coast before taking any formal action toward organizing.

Pacific Logging Congress Discuss Pulp Manufacture at their Annual Meeting

The Logging Congress at Portland, October 24 to 26, for the first time devoted a part of their program to a consideration of the probable effect of the increasing production of paper pulp in the region on their industry. The "Logger's Viewpoint" was discussed by J. J. Donovan, Bloedel-Donovan Lumber Mills, Bellingham; the "Pulp Manufacturer's Opinion", by O. K. Fosse, International Wool and Sulphite Co., Seattle; and the "Timber Owning Points of View" by E. T. Allen, Western Forestry and Conservation Association, Portland, Oregon.

Air-Seasoning of Douglas Fir Common

During the month Mr. Johnson's report "Degrade in Air-Seasoning Wide Douglas Fir Common Boards" appeared in the October issue of The Timberman. Six hundred reprints of the report have been received for distribution.

General Survey of Wood Waste in Logging in the Douglas Fir Region

Mr. Hodgson's report is being reviewed by several men in the District Office and by Mr. Munger of the Pacific Northwest Forest Experiment Station. As soon as these reviews are completed and any necessary revisions made the report will be ready to submit to the Forester.

Mr. Hodgson spent some time in labeling and preparing a large collection of photographs which he has taken in connection with the woods waste survey. Many of these photographs will no doubt be of value to other branches and offices of the Forest Service and the negatives will eventually be sent to the photographic section of the Washington office for numbering and filing.

Logging and Milling Study - Shevlin-Hixon Company

The field work in connection with the logging phase of this project was for the most part completed this month. With a primary objective of determining the relative cost of logging trees of different sizes, the method of approach consisted mostly of time studies. The volume of data was limited by time and personnel and is admittedly short of what might be considered desirable.

The work in connection with falling and bucking represents data on some 400 trees, covering 18 different saw crews and 21 working days. Stop-watch observations on the trees skidded on two half skidding settings, embracing about 20 acres and some 566 trees, constitute the bulk of the steam skidding data. Detailed time observations were made on the loading of over 600 logs followed. Skidding with "cats" and high wheels was observed on a time-study basis for 3 days, covering the work of 4 different cats. Due to the fact that the logging show embraced considerable ground with slopes over 25% and the high wheel's had to be abandoned in these places, the field work terminated at this point. These data may be insufficient to work out any differences in logging trees of different sizes, but they will serve at least to point out better methods and technique for future field work.

The bulk of Mr. Johnson's time was spent with Mr. Spelman at the logging camp of the Shevlin-Hixon Company, Bend, Oregon, making time

studies in connection with steam skidding. Mr. Johnson started computing the data secured in the western yellow pine mill utilization study made at The Shevlin-Hixon Company's mill at Bend, Oregon. The computing of these data, which covers about 3,000 logs, will entail a large amount of work.

The first week of October was spent by Hodgson at the woods operation of the Shevlin-Hixon Company checking over the area from which the mill study logs were taken and noting all marked logs that were overlooked by the loggers.

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RANGE RESEARCH

WASHINGTON

Mr. Chapline returned at the end of the month from his three and a half months' summer field trip. His main effort this year was to endeavor to speed up a number of publications which are in course of preparation by the range research force. Visits were made to the Great Basin Experiment Station, the Santa Rita and Jornada Range Reserves, to Cooperrider and Copple's work in northern Arizona, and to Quincy, California, to go over with Mr. Schoeller certain phases of the Carrying Capacity manuscript on the Jornada.

It was interesting to note the keen appreciation and understanding which the rangers at the Manti, Fishlake, and LaSal Ranger Meeting held at the Great Basin Experiment Station have of the principles which are being developed by the Great Basin Station. The meeting brought out clearly the importance of early expansion of the Intermountain research work to provide an adequate foundation for range management.

Mr. Chapline attended a very interesting meeting of the California Cattlemen's Association at Milford, California. The officers strongly emphasized to the stockmen the importance of holding no more cattle at this time than they were assured of having winter range and feed for. It was pointed out that prices were high and that it was desirable to sell closely and pay off debts. Under the present conditions it is highly desirable not to take any chances on having to purchase winter feed. In this connection it might be well to recall that in the winter of 1919 in Montana prices of livestock were high and many stockmen paid exorbitant prices for feed because of an unusually hard winter. With the slump the following year many livestock outfits were forced into bankruptcy that, had they sold down closely at the time of the high prices, would have doubtless come through the hard winter and slump in good condition.

West of the Rocky Mountains the rainfall has been unusually short this summer and feed has been shorter than usual throughout this entire area. Prices of livestock, however, are sufficiently high so that the stock industry is in a prosperous condition. Those stockmen who have stocked their ranges on a conservative basis are facing the future with the most assurance of continued prosperity.

While Mr. Chapline was at Tucson, Arizona, Dr. Homer L. Shantz, President of the University of Arizona, arranged for a conference between the prominent faculty members of the College of Agriculture and scientific workers of the Federal Government and endowed institutions

at Tucson to consider with Chapline the range research situation in the Southwest. Dr. Shantz stated that he hoped this would be the first of many informal conferences of a similar character, particularly to take advantage of the visits of outside scientific men to Tucson, to consider all phases of research work in which the State, and especially the College of Agriculture, is concerned.

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FORAGE INVESTIGATIONS

Field reclassification absorbed so much of Dayton's time during October that his regular duties were pretty much shelved for the nonce.

"Glossary" Returned to Editor

The "Glossary of Common Botanical Terms" was returned to Hunn for editing after having been completely revised, to meet the suggestions of the Board of Review. As now constituted it consists of 126 type-written pages, and contains definitions of 722 of the commonest terms used in taxonomic, morphological, dendrological, ecological, physiological, and range botany; also a list of 21 common botanical symbols, and of 78 of the commonest botanical abbreviations. It is illustrated by 47 small text figures which help to visualize 106 terms.

More About Common Names

Dayton spent the afternoon of October 26th with Dr. Coville, at the latter's request, on the nomenclature of a proposed floral guide for Death Valley, California.

Plant Collections All Cleaned Up In Washington Office

The field will be glad to know that for practically the first time in about two years, all plant collections submitted from the field have been sent to the Bureau of Plant Industry for determination; also all plants returned from the Bureau of Plant Industry have been reported to the field. This wiping of the slate will undoubtedly enable Miss Hayes to take up some more constructive work during November as well as to clean up some other of the "loose ends" of the project which need attention.

663 plants, representing 12 collections, were reported on to the Districts. A single collection was sent to the Bureau of Plant Industry for formal determination. 372 photostatic prints of economic-notes cards were sent to the field. Preliminary reports on 49 plants from 6 collections were made to the Districts. 1092 plants were repaired or remounted and 10 additional plants mounted.

Range Extensions, and Other Specimens of Special Interest

Oreocarya echinoides (Jones) Macbride, usually listed in floras as occurring from California eastward to Utah, has now been collected by Ranger J. G. Kooch on the Targhee National Forest in Idaho, and submitted as his no. JK-35, Washington office no. 57540.

Probably the first New Mexico record of the brome grass Bromus Laevipes Shear (collector's number E-96, Washington office number 58220), was collected by Assistant Range Examiner Robert B. Ewing on the Lincoln National Forest in New Mexico. This grass is being deposited in the National Herbarium at the request of Mrs. Chase who states that they have specimens of this from California, Oregon, and one from Arizona, but none hitherto from New Mexico.

Associate Range Examiner Fred P. Cronemiller's no. 3027, Washington no. 58718, prove's to be Goatgrass (Aegilops triuncialis L.), a species introduced from Europe, and which has become a noxious pest in parts of California and southern Oregon, crowding out the valuable forage grasses and causing such severe injury to their bands that local sheepmen are actively interested in its extermination. Goatgrass does not appear in the manuals.

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REPORT FOR SEPTEMBER AND OCTOBER - D-3

Training Camp

The D-3 senior training camp attended by experienced rangers, assistant supervisors, and range examiners assigned to forests was in session the last half of August and early September. About a week's time was devoted to the school in classroom and field presenting general matters pertaining to range management and the indications from research projects under study locally.

Several county agents, agricultural extension men and range specialists from the University of Arizona attended the range management course.

Visitors

Early in September a trip was made into the Tonto Basin region with H. H. Bennett and H. E. Middleton of the Bureaus of Chemistry and Soils. These men are making an extensive study of erosion, its tendencies and causes. The natural revegetation studies, especially those on the Lower Salt River watershed contributory to Roosevelt Dam, were of particular interest to the erosion specialists. Areas in this region that would casually be considered to be desert scrub-brush lands have been proven to be capable of supporting herbaceous vegetation that once controlled the excessive runoff of rain water.

Mr. Marsh of the Washington Office gave us a few days of his time in August. In mid September Mr. Chapline inspected the work on active projects and particularly that of the study of range management in the sawtimber type on the Colorado Plateau.

Parkinson of D-4, Keplinger of D-2, and Pitchlynn of D-5 had a look at either the work on the experimental cattle or sheep range in western yellow pine cutover forest while visiting the training camp.

Mr. Bryan of the Hawaiian forestry branch of lands, Department of Interior, and Mr. Manaja, assistant chief of the Branch of Lands, Philippine Bureau of Forestry, each spent a day observing work on the experimental cattle range in western yellow pine cutover lands.

Mr. Demmon, Director of the Southern Forest Experiment Station, gave some time to our work in connection with his visit to the Southwestern Forest Experiment Station in September.

Weather

Very dry years are the rule rather than the exception during dry cycles. The season of 1928 has been one of the driest on record in central and north central Arizona.

Influences of the season have been very interesting.

With the possible exception of needle length 1919 pine seedlings made a reasonably normal growth in 1928 from stored ground water from early winter snow. Ground water from snow enabled early maturing herbs to make normal growth while late maturing grasses such as Muhlenbergia montana and Sporobolus interruptus, either made short growth or failed to

flower. One can readily see why an early maturing coarse bunchgrass like Festuca arizonica dominates heavily grazed cutover forest range during a series of dry summers, and at the expense of the more palatable late maturing grasses.

Rather severe losses in density were sustained in protected plots, particularly among the turf grasses at low elevations. As nearly as may be judged there is a direct relation between loss of vegetation and character of soil. Where vegetation more nearly approached depletion before protection, and soils in the type changed most on account of surface erosion, the loss of reestablished vegetation is greatest. The ability of soil and soil cover to absorb and retain moisture seems to determine the relative amount of loss of vegetation during drouth.

Project Activities

The season's field work on management of bunchgrass range in cut-over yellow pine forest on the Colorado Plateau in northern Arizona is nearing completion.

Sheep left the experimental range in late September. They went on the winter range in excellent condition.

Steers on the cattle range under study were sold at 10¢, late October delivery. They went to Imperial Valley for finishing. The weight of aged steers must have been well over 1200 pounds as the entire herd made up of small and aged steers and a few dry cows, averaged a little under 1,000 pounds. The best steers sold locally averaged slightly more than 1,000 pounds, but they were picked bunches and not the entire herd on the range as was the case with those from the experimental range.

Some Indications from Work on Management of Bunchgrass Range in Yellow Pine Cutover Forest Lands

1. The main shoot growth of established pine reproduction takes place during the early summer dry season.

2. Grazing of pine shoots by either sheep or cattle is largely confined to the latter one-half to two-thirds of the period of pine growth before the shoots develop a lignous core.

3. Pine needles remain free from fibre, are succulent, continue growth after length growth of the supporting shoot is complete. They are easily pulled from the basal sheath at any time before maturity in the fall. Where such damage occurs, late summer and fall are the periods during which needle pulling characterizes grazing injury to reproduction.

4. Grazing injury on the range, whether to shoots or needles, is confined to the current year's growth.

5. As indicated there are two distinct kinds of injury that may be termed shoot damage and needle pulling and in the same order two distinct periods of injury, one occurring early, the other late in the summer grazing season.

6. During the periods in which particular kinds of injury occur, cattle and sheep may graze established pine reproduction in very much the same manner and in varying degrees of intensity dependent on the following conditions:

A.- After the better forage plants are over-utilized and on areas where the dominant grasses have been overgrazed at some time during the season for a number of years.

B.- In certain years when the rainfall during the growing season is far below the average; when forage plants make scant growth and bunchgrasses become wilted and hay-like causing a shortage of succulent forage, particularly in the heavier used areas.

C.- On both over and moderately utilized range when the feed area and stocking is out of proportion to the readily available water.

Poorly watered range in this region of developed waters often has a large percentage of the forage that cannot be readily reached except during rainy periods. Cattle will travel long distances in search of succulent feed and remain away from water for days. Sheep are often held away from water for days at a time.

The normal bunchgrass type has an appreciable amount of very succulent weed forage. The grasses produce some succulent leaf growth even during a very dry season. Cutting of timber, overgrazing the better forage, concentration of stock near widely distributed waters has caused a decline in good forage species that are available before the rainy season, and as might be expected a loss in the total volume of forage or the dominance of grasses that are most hay-like during the late dry season.

As the dry season advances and the more succulent feed is utilized stock traveling far from water and depending largely on dry feed graze the succulent shoots of reproduction excessively.

A preliminary test of relative moisture content of grasses and pine shoots follows:

(Specimens collected during a dry period in July, 1928 but after the first showers. Weights taken immediately after cutting, and again after air drying).

1. Average of mixed grasses.....27% loss, air dry
2. Best grass (most succulent).....47% " " "
3. 1928 growth of leaders and laterals
from 1919 seedlings.....74% " " "

(Collections made after first effective rains but on warm, dry days)

1. Average forage.....57% loss, air dry
2. Best forage.....62% " " "

The deficiency of rainfall in the spring and summer of 1928 was one of the greatest on record. Water content of forage during the average rainy season probably equals or exceeds that of the shoots of pines securing their moisture below the root systems of grass.

Geological formations and their placement cause the scarcity of water on the Colorado Plateau. It is a region of developed stock waters, coarse bunch grasses - all the dominant herbs on heavy clay soils low in humus.

May not the scarcity or poor distribution of waters, the low moisture content of the dominant grasses during dry periods, and the high water content of seedling growth, account for the following:

Heavy use of seedling growth during dry periods as compared to the almost total absence of damage during wet periods when grass is succulent, water reasonably plentiful, and the needs of the animal for water much less.

The marked difference between the intensity of damage during different years and the increase in amount of damage with the decrease in amount of succulent forage as compared to the almost total absence of damage to established reproduction in the presence of readily available feed and water.

It seems highly probable that an important phase of the solution of the problem of damage to established reproduction on bunchgrass range lies in stocking the range on the basis of the real feed readily accessible from water and in the development of water in the feed areas not well watered.

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JORNADA RANGE RESERVE

Range Conditions

In spite of the low seasonal precipitation of 4.35 inches, as compared to 4.70 inches mean seasonal for the region, the range within the reserve is in excellent condition. The native range grasses produced an excellent forage crop where the range had been subjected to conservative use. This condition is especially noticeable in the case of Black Grama (Bouteloua eriopoda) and the several species of the genus Sporobolus. The Tobosa grass, (Hilaria mutica) did not do so well in all instances. A poor forage crop is generally reported for similar ranges on the outside.

Condition of Stock

Cows and calves are in excellent condition. There is every reason to believe that the Jornada calves will continue to top the market for this region. 100 head of fat cows that have been culled from the breeding herd are now in first class condition for the market.

The total death loss consists of three cows killed by lightning and one calf which died from an undetermined cause. The low loss record for the reserve is extremely gratifying since the reports from similar outside ranges indicate a relatively high death loss in mature cattle from starvation and a considerable increase in the mortality of calves over the Jornada figure.

Improvement

The cooperator is pushing the water development work on the Reserve, having recently completed a sixty-five thousand gallon steel storage tank and two drinking tubs at Red Lake in Pasture No. 1. This tank is the fifth of its kind to be constructed by the cooperator on the reserve.

Investigation Work

The Black Grama and the Tobosa grass clipping studies were closed for the season during the first part of the month.

The annual charting of the quadrats was completed in record time this year and the computation of quadrat data is now well under way.

The field work on the reconnaissance which was started on the reserve this fall is nearing completion. With this additional reconnaissance data it should be possible to determine the variation in carrying capacity of the reserve on a forage-acre basis, thus making the results of the Jornada natural revegetation and the carrying capacity studies more readily applicable to other ranges, especially those National Forest ranges for which forage acreage is available.

Visitors

Mr. Chapline of the Washington Office spent the week of October 20 to 27 on the Jornada. During Mr. Chapline's stay he checked field methods and results, instructed and aided the Jornada personnel in the analysis of data, and went over many other phases of the work here such as work plans, cooperative agreement and various manuscripts which have been presented for publication.

Personnel

Ranger R. V. Galt of the Guadalupe District of the Lincoln National Forest completed a detail of one month to the Jornada on October 13th.

Mr. Galt spent most of the time on reconnaissance. However, he took a part in all the current activities such as clipping studies, charting quadrats, and the computation and compilation of data.

Mr. Galt was keenly interested in all phases of the Jornada work and was very much pleased with his experiences during his stay. His only regret was that his detail was terminated before Mr. Chapline arrived, since a part of the Guadalupe District is the scene of Mr. Chapline's early work on his goat study.



